

REFERENCE COPY

DO NOT REMOVE
FROM THIS ROOM**MAGAZINE**

OCTOBER 29, 1991

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 10 NUMBER 18

FIRST LOOKS

**Toshiba's Best Notebook Yet:
386SX, 5.5 Pounds,
3.5-Hour Battery**

HARDWARE

**All CD-ROM Drives
Are Not Equal!
We Tell You Which
Do Multimedia**

SOFTWARE

**Do Antivirus Programs Really
Work? PC Labs Tests
11 Packages**

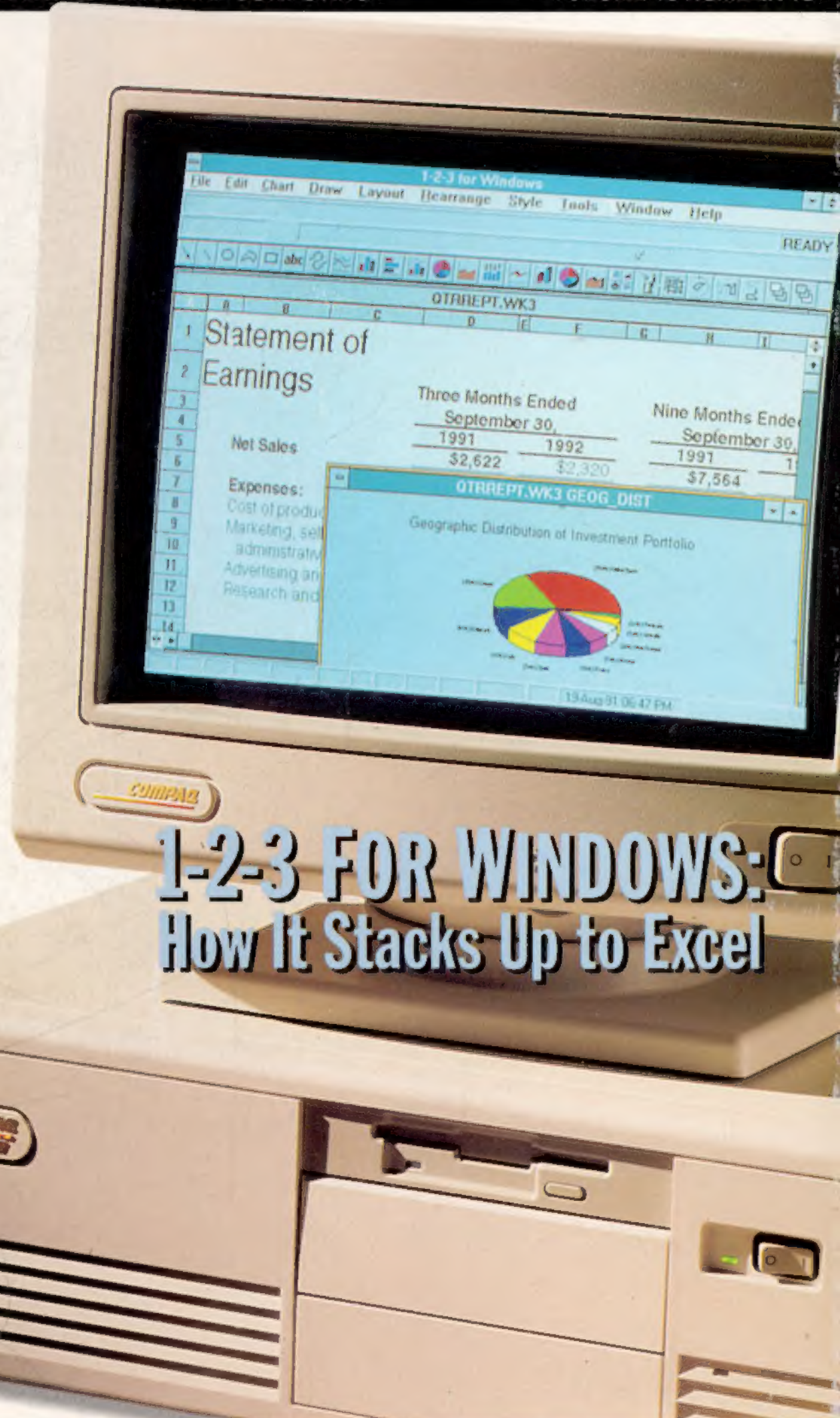
AFTER HOURS

**Personal Financial
Help from Prodigy,
GENie, CompuServe,
And America Online**

UPGRADE YOUR PC!

▪ **10 Technologies
Make It Possible**

▪ **A First Look
At Compaq's
Affordable
Modular PCs**



**1-2-3 FOR WINDOWS:
How It Stacks Up to Excel**



It took us
thousands of
steps to make
this spreadsheet
do what we
wanted.

B

Pro Forma Inc

1991

184,845

49,292

1,232,300

1,466,437

184,845

If You Just Bought

**First
i486SX-
based
EISA PC
for under
\$2,000.**



It took over a year to develop the custom components (ASICs) needed to make the space-saving ALR BusinessSTATION™ a price and performance leader, but the wait is finally over. You can now get a smaller and more powerful system than the Compaq® 386s/20™ for less money. And look at all these extra features!

Unlike the Compaq® 386s/20™, the BusinessSTATION gives you an advanced EISA bus for greater data throughput. This advanced 32-bit bus takes advantage of the latest in high-performance enhancements – such as high-speed network cards and future multimedia controllers– while still remaining compatible with popular, low-cost 16-bit ISA boards. You'd have to pay over \$6,000 to find the same feature in a Compaq system. A proprietary ALR Enhancement

Slot also offers connectivity to BusinessSTATION optimized SCSI, scanner, and Ethernet adapters.

Both of these systems offer sleek, space-saving, styling, but the ALR BusinessSTATION 486ASX also features the new Intel® 20-MHz i486SX™ processor. The Compaq® 386s/20™ only has a i386SX™ processor. As a result, the BusinessSTATION offers almost twice the CPU power and compatibility with future i486-based software.



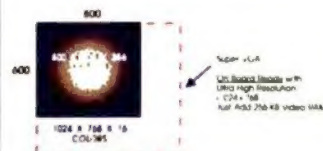
The BusinessSTATION packs an array of other high performance features in its small-footprint box. Features like Built-In Super VGA. This design saves a valuable expansion slot, while offering eye-saving resolutions of up to 800x600 (1024x768 with an optional enhanced graphics package), and up to 25% greater performance than standard VGA cards.

With its built-in DMA IDE hard drive controller, the BusinessSTATION provides direct memory access to hard drive functions. Utilizing 32-bit

Twice the CPU Power



Not Just Standard Video



a Compaq® 386s/20™

Take It Back!

Introducing the ALR® BusinessSTATION™

i486SX, i486DX/33 & i486DX/50

EISA technology, it can increase performance up to 300% while still being compatible with standard IDE drives.

And if you should ever need to boost system power even more, you can increase processing 25% by simply plugging in a 25-MHz i486DX™ chip. More power? The BusinessSTATION's

Just Upgrade the CPU!™ modular design gives you the ability to replace the 20-MHz i486SX module with a 33- or 50-MHz i486DX module.

	ALR®	Compaq®
	BusinessSTATION™	Deskpro 386s/20™
Processor	486ASX	
Memory Cache	20-MHz i486SX™	20-MHz i386SX™
Standard Bus	8-KB	4-KB
Standard RAM	32-bit EISA	16-bit ISA
Expandable on-board to	1-MB	2-MB
Expansion Slots	33-MB	16-MB
Standard Video	5	4
Upgrade Path	Super VGA (800x600)	VGA
Starting Price	25-, 33- & 50-MHz i486DX™	None
	\$1,995	\$2,095

Ounce for ounce and dollar for dollar, there is no better "slim-line" system than the ALR BusinessSTATION.

The BusinessSTATION is also available in 33-MHz 386, and 33- and 50-MHz i486DX versions. Visit your local ALR reseller, and find the perfect system for you today!

Call: 1-800-444-4ALR

ALR®

Advanced Logic Research, Inc.

Irvine, CA 92718
TEL: (714) 581-6770 FAX: (714) 581-0240

Available at these nationwide locations:

ComputerLand Connecting Point 222 COMPUTER CENTERS



Gateway



HP



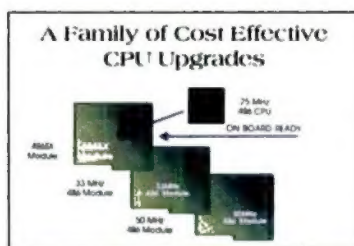
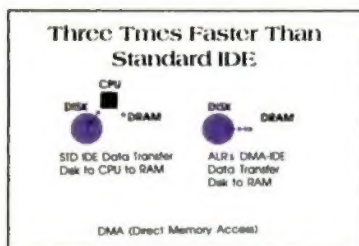
ALR



Power Partner



Resellers



CIRCLE 165 ON READER SERVICE CARD

EVERY HARD DRIVE YOU BUY IS A PACKAGE DEAL

MicroLab gives you a great price and more with every purchase.

Whenever you purchase, whatever you purchase from MicroLab, you'll always get something of special value. Of course, you'll get a low price on name brand, state-of-the-art computer products. But you'll also receive a host of MicroLab benefits like:

- Products you can trust...thoroughly tested to insure performance, reliability and compatibility.
- A company you can trust...with a commitment to quality.
- Award-winning MicroLab backing and technical support.
- A 30-day money back guarantee.
- Complete product warranties.



Plus, you'll get the chance to make MicroLab your on-going business partner if you elect to join the exclusive MicroClub ValuePlan™ Preferred Buyer Club. As a member, you'll get discount opportunities, among other great benefits, on all future purchases...for a lifetime!

Why buy somewhere else when MicroLab gives you a great price, and a great package!

5.25" Hard Drives

Seagate ST225 20MB, 65ms, MFM, HH.....	*169
Seagate ST230H 30MB, 65ms, RLL, HH.....	179
Seagate ST250H 40MB, 66ms, RLL, HH.....	189
Seagate ST251-1 40MB, 28ms, MFM, HH.....	219
Seagate ST277H-1 65MB, 28ms, RLL, HH.....	249
Seagate ST296H 80MB, 28ms, SCSI, HH.....	279
Seagate ST480H 80MB, 28ms, MFM, FH.....	449
Seagate ST4144H 120MB, 28ms, RLL, FH.....	529
Seagate/Imprimis ST4182E 160MB, 17ms, ESDI, FH.....	749
Seagate/Imprimis ST4182N 155MB, 17ms, SCSI, FH.....	759
Seagate/Imprimis ST2383E 337MB, 16ms, ESDI, HH.....	1169
Seagate/Imprimis ST2383N 338MB, 16ms, SCSI, HH.....	1179
Seagate/Imprimis ST4384E 329MB, 15ms, ESDI, FH.....	1199
Seagate/Imprimis ST4768E 676MB, 16ms, ESDI, FH.....	1429
Seagate/Imprimis ST4768N 676MB, 16ms, SCSI, FH.....	1439
Seagate/Imprimis ST41200H 1050MB, 17ms, SCSI, FH.....	2099

3.50" Hard Drives

K/Lok KL329 20MB, 40ms, MFM, HH.....	*129
K/Lok KL 330 30MB, 40ms, RLL, HH.....	139
Seagate ST157A 44MB, 28ms, IDE, HH.....	169
Seagate ST167H 50MB, 28ms, RLL, HH.....	229
Seagate ST1102A 65MB, 10ms, IDE, HH.....	269
Seagate ST1144A 130MB, 10ms, IDE, HH.....	339
Seagate ST1162A 143MB, 15ms, IDE, HH.....	369
Seagate ST1201A 177MB, 15ms, IDE, HH.....	549
Seagate ST1230A 211MB, 15ms, IDE, HH.....	579
Seagate/Imprimis ST1100 80MB, 15ms, MFM, HH.....	599
Seagate/Imprimis ST1162N 142MB, 15ms, SCSI, HH.....	679
Seagate/Imprimis ST1201E 177MB, 15ms, ESDI, HH.....	895
Seagate/Imprimis ST1201N 177MB, 15ms, SCSI, HH.....	945



ORDER NOW TOLL FREE
1-800-288-7828

INTERNATIONAL ORDERS: (313) 474-7046
SALES FAX: (313) 474-0843 / MAIN OFFICE: (313) 474-7711
Hours: Monday-Friday 9-5 EST / Saturday 9-5 EST
23976 Freeway Park Drive / Farmington Hills, MI 48335

Copyright ©1991 MicroLab. All logos and trademarks are registered trademarks of their respective companies. We welcome pre-payments, Visa, MasterCard, Discover and American Express, in addition to APO/FPO and CDS orders. Unsubscribed and Fortune 1000 purchase orders accepted with approved credit. Prices and availability subject to change without notice. 30-day Money Back Guarantee excludes shipping and handling charges. Please call to confirm pricing, specifications and warranty details.

Inside

Virus attacks, once portrayed as a threat to the very essence of personal computing, have become just another modern annoyance—facts of life that we all have to deal with defensively.

In planning this issue's review of virus protection software, we knew that the only way to test a product's long-term value was to try and fool it. All of the programs put on the market in recent years have been tested against

the common strains, the Jerusalem B's and the Brain derivations. If they're any good at all, the antiviruses will be able to detect and disarm the common germs.

What really matters is if you're protected against the virus that will be hatched tomorrow. To give you that

kind of information, PC Magazine Labs set out to present the ultimate challenge to each of these products: a virus designed specifically to fool the protectors.

As expected, some of the products were completely defenseless against these new invaders. Others rose to the challenge.

The magazine's software team managed the job, from planning to writing. Labs project leader Gabrielle Gagnon (who appeared most recently in this column when she directed testing on relational databases) commissioned specialists to create the new



virus. Staff editor Carol Levin worked with the authors. And software associate editor Don Willmott supervised the preparation of the story.

With five years of experience at *PC Magazine*, Willmott has been through all types of testing, from the very first 386 PC roundup in 1987 to last issue's review of high-end accounting.

After experiencing the hands-on tests, talking to the manufacturers, and reviewing the findings with our writers,

Willmott's advice is partly cautionary and partly routine.

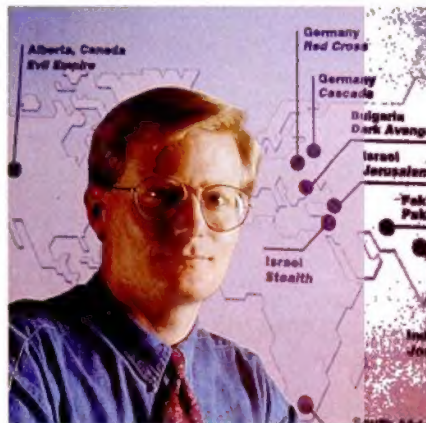
The real lesson, he says, is to make sure you update regularly, no matter which antivirus product you use. And the best defense against a virus attack is still the old-fashioned full-disk backup.

By the way, don't be worried

about that brand-new virus we created. It was nondestructive.

Also in this issue you'll find a review of machines that represent the latest trend in PC design: upgradable architectures. With manufacturers introducing new processors almost quarterly, it's a trend that we expect to see continue.

And in anticipation of the coming wave of multimedia software due later this year, we review 15 CD-ROM drives. You'll need one to watch and listen to exciting disks like *Multimedia Beethoven*, scheduled for a Christmas release.—Gus Venditto ■



Software associate editor Don Willmott studied the strange world of viruses for this issue's roundup of 20 antivirus utilities.



How An Unlimited Imagination Thrives On A Limited Budget.

The world's most-persuasive graphics software is now the most-affordable. CA-Cricket Presents is now just \$199, and CA-Cricket Graph is only \$129.



It's fast, easy and fully integrated. It's CA-Cricket® Presents™, and it has every feature you need to bring your ideas to life.

A built-in outline so you can organize your thoughts. Predesigned graphic templates. An electronic light table to edit and re-sequence

your presentation. Plus speaker's notes and presentation-quality handouts and transparencies. And as you can see, you can even import graphics and scanned images from a wide variety of file formats



including TIFF, CGM, Windows Metafile, Encapsulated PostScript and ASCII Text Files.

Need graphs for the slide show? Switch over to CA-Cricket® Graph!™ It comes with a selection of twelve graph types, plus all the color and fonts you need. With just a few clicks of the mouse, you'll have the charts and graphs that'll make your presentations shine.

So call 1-800-645-3003 today for the location of your nearest dealer.

Now there are no limits to what the mind, or the wallet, can do.

COMPUTER ASSOCIATES
Software superior by design.

© 1991 Computer Associates International, Inc., 711 Stewart Avenue, Garden City, NY 11530-4787. All trade names referenced are the trademarks or registered trademarks of their respective manufacturer.

CIRCLE 381 ON READER SERVICE CARD

Why your next should be a

Graphical computing is the way the world is going. The editorials agree. The industry pundits agree. Even our competitors' ads agree.

The kind of computing Apple® Macintosh® personal computers first made popular back in 1984 is the way a computer should work.

But with a head start of several years, a long history of innovation and an architecture optimized for graphical computing from the very beginning, Macintosh remains the definitive form of graphical computing.

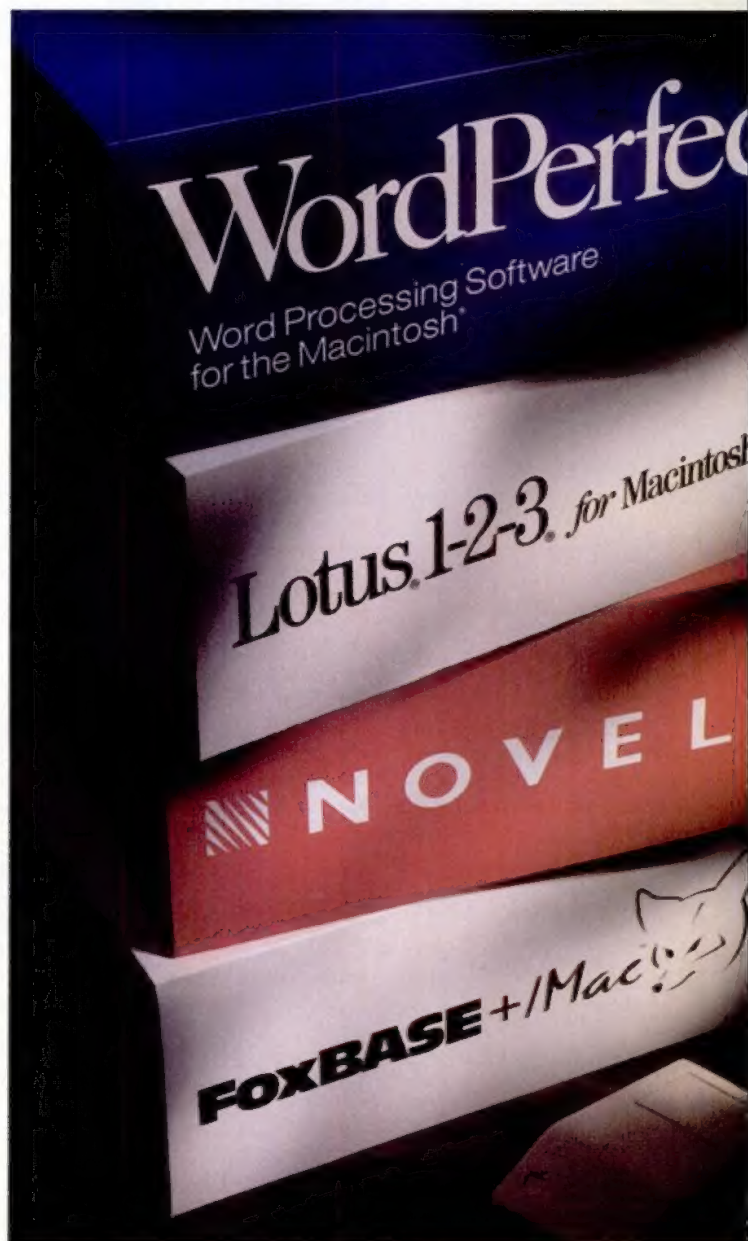
And now, with new Macintosh versions of some of the most popular DOS programs, you can have all the benefits of a Macintosh without sacrificing any of your investment in MS-DOS PCs, applications and data.

Take Lotus 1-2-3 for Macintosh. It's a whole new kind of Lotus 1-2-3 created expressly for Macintosh. The editor of the industry newsletter *Softletter* calls it nothing short of "a design triumph."

It has the power you expect from the world's most popular spreadsheet. Plus exciting new features like the flexibility to directly manipulate data, text and graphics all in the same file. And a new level of charting, graphing and drawing capability that's unique to Macintosh. (And it's fully compatible with all other versions of 1-2-3.)

Or consider the new WordPerfect for Macintosh. Its compact, easy-to-understand menus and streamlined dialog boxes give you easy access to all the features you're used to from the leading word processor, along with some exciting new capabilities added just for Macintosh.

For example, a graphics and drawing package is built



For more information about Lotus 1-2-3, call 800-TRADEUP, ext. 6007. About FoxBASE+/Mac, call 800-837-FOX2. About WordPerfect, call

© 1991 Apple Computer, Inc. Apple, the Apple logo, Mac, Macintosh and "The power to be your best" are registered trademarks, and SuperDrive is a trademark of Apple Computer, Inc. Lotus 1-2-3 for Macintosh will be available in fall 1991. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. FOXBASE+ is a registered trademark of International Business Machines Corporation. dBASE is a registered trademark of New Era Software, Inc. Mention of third-party products is for informational purposes only.

DOS computer Macintosh.



right into the program. Which means graphic images, charts and sidebars can be added and edited without any reformatting hassles.

There's also the powerful new FoxBASE+/Mac, which is up to 10 times faster than most other database packages. It takes full advantage of the graphic, intuitive Macintosh way of working, and allows Macintosh and DOS users to access the same data simultaneously. And it can read dBASE files, too.

There's even Novell NetWare for Macintosh, which connects Mac[®] into the most popular PC networking software in the world today. It lets you take advantage of the networking capabilities built into every Macintosh personal computer to integrate with virtually any other operating system: MS-DOS, Windows, OS/2 and even UNIX and SNA environments.

All these programs take advantage of the built-in Apple SuperDrive[™] disk drive to let you easily exchange information between your MS-DOS PCs and Macintosh computers on a standard 3 $\frac{1}{2}$ " floppy disk.

Like all Macintosh programs, they let you copy work you've done from one and paste it into another, so their combined power is even greater.

For more information on all these programs, see the phone numbers listed below. Or visit the authorized Apple reseller nearest you.

You'll discover that Macintosh may be the most powerful, flexible, affordable DOS computer you can buy today. The computer with the power you really want. The power to be your best.



800-526-7820. About NetWare, call 800-NETWARE. For the name of the authorized Apple reseller near you, call 800-538-9696, ext. 825.

Lotus Development Corporation. FoxBASE+ and FoxBASE+/Mac are registered trademarks of Fox Software, Inc. WordPerfect is a registered trademark of WordPerfect Corp. NetWare is a registered trademark of Novell, Inc. MS-DOS is a registered trademark and Windows is a trademark only. All product specifications and descriptions were supplied by the respective vendor or supplier. All understanding, agreements or warranties, if any, take place directly between the vendors and the prospective users. This ad was created using Macintosh personal computers.

UP FRONT

4 INSIDE

17 LETTERS

29 PIPELINE Gus Venditto

- 35 FIRST LOOKS**
■ AST Premium Exec 386SX/25: AMD chip makes the difference.
■ Lotus 1-2-3 for Windows: Is it enough to move you?
■ Lexmark Laser Printer 10L takes on the HP LaserJet IIIi.
■ 5.5-pound T2200SX: Toshiba's best laptop ever.

61 NEW AND IMPROVED Nate Zelnick

71 READ ONLY Matthew J. Ross

75 TOOLKITS Trudy Neuhaus

COLUMNISTS

79 MICHAEL J. MILLER The Killer App

85 BILL MACHRONE Windows Bugs: Conspiracy of Silence?

91 JOHN C. DVORAK Consolidation and Fragmentation 93 Inside Track

97 JIM SEYMOUR 2001, Part II: Software That Knows Us

105 WILLIAM F. ZACHMANN This Means War. . .

COVER STORY

35 FIRST LOOKS

Upward Mobility, Compaq Style

Matthew J. Ross/ Compaq responds to the competition with a new line of 386 and 486 upgradable PCs. The new Compaq Deskpro/M family of modular PCs offers 800-by-600 Super VGA graphics, aggressive pricing, and a range of processor choices including two new Intel offerings, the 16- and 25-MHz 80486SX.



FEATURES

111 COMPUTERS

Upgradable PCs: Betting on Tomorrow

Winn L. Rosch/ PC Magazine Labs tests 10 upgradable PCs that accept a range of processors and stretch your hardware investment to its maximum.

- | | |
|----------------------------------|-------------------------------------|
| 121 ALR BusinessVEISA | 156 Copam B Series |
| 128 ALR Modular Processor System | 163 Dell System 333P |
| 128 ALR SX PowerFlex | 164 Everex STEP 386 with InSTEP 486 |
| 144 Amkly 386/25e | 170 Reply Model 32 |
| 146 AST Premium II | 171 Tandon Option |

- 112 Price/Performance Index
 117 Editors' Choice
 120 Additional Sources
 122 Summary of Features
 124 Performance Tests

181



COMPUTERS

SX Transplants: The Band-Aid Fix

Bill O'Brien/ PC Magazine Labs tests five inexpensive 80386SX CPU upgrades that drop into AT-class PCs. Sounds like a good idea . . . maybe too good to be true.

- | | |
|----------------------------|-----------------------|
| 186 AOX StaX SX | 182 Editors' Choice |
| 189 Cumulus 386SX Card | 188 Performance Tests |
| 193 Intel SnapIn 386 | |
| 194 Kingston SX-Now! | |
| 197 Microway FASTCache-SX | |
| Microway FASTCache-SX/Plus | |

199 SOFTWARE

On Guard: 20 Utilities That Battle the Virus Threat

Carol Ellison/ A little common sense and a good antivirus utility go a long way toward protecting your PC and your data from viruses. PC Labs tests 20 utilities against six deadly strains to pinpoint which product best detects and protects against virus attacks.

- 208 AntiVirus Plus
 213 Central Point Anti-Virus
 216 Certus
 217 Data Physician Plus
 217 Dr. Solomon's
 Anti-Virus Toolkit
 225 Flu_Shot Plus
 233 Mace Vaccine
 233 The Norton AntiVirus
 237 Panda Pro
 238 SafeWord Virus-Safe
 238 Vaccine
 247 Virex-PC
 247 ViruCide
 250 ViruSafe
 255 Viruscan
 256 VirusCure Plus
 260 Virus Guard
 267 Virus-Pro



- 268 Virus Secure for Windows
 278 Vi-Spy

- 200 The Wide World of
 Viruses
 201 Five Common-
 Sense Tips for Safer
 Computing
 207 Editors' Choice
 226 Summary of
 Features
 249 Why Your FAT
 Needs Protection
 250 Covering Your
 Bases: Ways to
 Protect Data from
 Unauthorized
 Access
 268 A Virus Family
 270 Performance Tests

FEATURES



283 **HARDWARE** **CD-ROM Drives:** **Finally Up to Speed**

Mitt Jones/ The multimedia phenomenon is just beginning, and *PC Magazine* is there with 15 of today's mainstream CD-ROM drives. All have data transfer rates of 150 kilobytes per second and audio jacks to support tomorrow's multimedia applications. Also look for our list of the most popular and most interesting CD-ROM titles.

- | | |
|------------------------------------|----------------------------------|
| 299 CD Porta-Drive Model T3201 | 336 Todd Enterprises TCDR-6000 |
| 305 Chinon CDX-431 | 338 Toshiba TXM-3301-E1 |
| 314 GenSTAR 2000 | |
| 323 Hitachi CDR-1750S | |
| 324 IBM PS/2 External CD-ROM Drive | 285 Editors' Choice |
| 325 Laser Magnetic Storage CM 231 | 286 From The Canterbury |
| 326 NEC Intersect CDR-73 | Tales to the Yellow |
| 327 PLI CD-ROM Drive | Pages, CD-ROM Titles |
| 330 Procom Allegro Series, | Are Ready to Deliver |
| Model PXCD650S | 300 The Traveling CD-ROM: |
| 331 Sony CDU-7205 and CDU-7211 | Five Choices |
| 333 Tandy CDR-1000 CD-ROM Drive | 308 Summary of Features |
| 334 Texel DM-5021 | 312 Performance Tests |

341



GRAPHICS

Artistry for All: **Four Illustration Packages**

Kellyn Betts/ It takes more than imagination to make pretty pictures on the PC; you need a good illustration software package. *PC Magazine* rounds up four products—including the new version of Micrografx's *Designer*—and tells you which one will best enhance your creativity.

- | | |
|--------------------------------------|--------------------------------|
| 346 Arts and Letters Graphics Editor | 345 Editors' Choice |
| 349 CorelDRAW | 351 Summary of Features |
| 351 <i>Designer</i> | 367 How We Tested |
| 368 Digital Research Artline | 370 Performance Summary |

AFTER WORDS

459 **ADVISOR**

Joe Salemi/ Adding a CD-ROM to an existing SCSI controller; is the 486 really superior to the 386?; finding support for Leading Edge products.

496 **AFTER HOURS**

In a special edition of After Hours, we examine the tools for personal investment management that the five leading on-line services provide.

502 **ABORT, RETRY, FAIL?**

Bill Howard

- | | |
|---------------------------------|--------------------------------|
| 489 PC MagNet News | 491 Index to Advertisers |
| 432 Direct Marketing Connection | 485 Reader Service Card |
| 461 Marketplace | 495 Editorial Product Index |
| 462 Premier | 494 Coming Up |
| | 492 Advertisers' Product Index |

PRODUCTIVITY

377 **LAB NOTES**

Andrew Schulman/ A BASIC Approach to Programming in Windows, Part 2

391 **UTILITIES**

Gene Kavner/ Save Your Configuration Changes Without Leaving Windows 3.0

403 **ENVIRONMENTS**

Charles Petzold/ Beyond the Beep: The Coming of Multimedia Windows

407 **POWER PROGRAMMING**

Ray Duncan/ Programming Considerations for MS-DOS 5.0, Part 1

413 **WINDOWS**

Fran Finnegan/ Eliminate the Microsoft logo display by changing 1 byte of WIN.COM; run Real- and Enhanced-mode Windows at the same time; load filenames without extensions using a handy *PC Magazine* utility.

415 **DATABASES**

Sal Ricciardi/ A UDF lets you pop up a *Clipper* calendar from within your application; add DISPLAY STRUCTURE and any other commands to *Clipper* 5.0 in a snap.

417 **SPREADSHEETS**

Craig Stinson/ Use Microsoft Excel's array formulas to cross-tabulate worksheets; start up Excel 3.0 the way you want with these undocumented switches.

419 **THE WORKING WORD**

Costa Rodis/ Three macros help you find and delete unwanted double spaces from your *Winword*, *Word* 5.0, and *WordPerfect* 5.01 documents.

423 **USER-TO-USER**

Neil J. Rubenking/ Don't let your program try to print to a nonexistent printer; a batch file that makes sequential numbering easy.

425 **TUTOR**

Jeff Prosser/ Discover some valuable information about DOS 5.0 in README.TXT; a trusty old trick lets you get around the 127-character limit for PATH statements.

429 **CONNECTIVITY**

Frank J. Derfler, Jr./ Advice for amateur radio operators; linking computers with a zero-slot LAN; using cable television systems for wide area networks; determining throughput on a LAN; using a BBS on a network.



Publishing Director Bill Machrone

Editor-in-Chief Michael J. Miller

Editor Joel Dreyfuss

Executive Editors Bill Howard, Gus Venditto

Workgroup Systems Editor Frank J. Derfler, Jr.

Senior Editors Trudy Neuhaus (Productivity), Robin Raskin (First Looks)

Senior Editor, West Coast Christopher Barr

Managing Editors Diane D'Angelo, Paul B. Ross

Assistant Managing Editor Dianne H. McDonald

Manager, Copy Edit Karen A. Carter **Associate Editors** Julie Cohen (PCs), Mary Kathleen Flynn (Hardware),

Jonathan Matzkin (After Hours), Rock Miller (Graphics), Sharon Terdeman (Productivity), Don Willmott

(Software), Jennifer Zaino (Connectivity) **Technical Editor** Neil J. Rubenking **Copy Chief** Glen Becker

Assistant Production Editors Jeanne Albrecht, Alan Cohen, Wendy Murch **Staff Editors** Michael Cohn,

Gayle C. Ehrenman, Carol Levin, Michael W. Muchmore, Ann Ovodow, Oliver Rist, Matthew J. Ross, Craig L.

Stark **Assistant Editors** Nina Barringer, Karen Best, Robin B. Bornstein, Gavin Edwards, Stephanie Izarek, Ellyn

McCasland, Kim Schueler, Shari L. Serio, Nate Zelnick **Editorial Assistants** Eric Berlin, Laura Cox, Carolyn

Falconer, William P. Flanagan, Angela Gunn, Catherine Kunkemuller, Susan G. Thomas, Emerson A. Torgan

Proofreaders Daniel A. Begun, Chris Regan **Editorial Trainees** Camille N. Cline, Bradley C. Grimes **Associate**

Business Manager Allen Wollman **System Support Manager** Craig Ellison **Network Administrator** Debbie

Lewis **Librarian** Thomas W. Giebel **Assistant to the Publishing Director** David Baker **Assistant to the Editor-in-**

Chief Tara Caulfield **Assistant to the Editor** Rita Aprahamian **Assistant to the Executive Editors** Christina M.

Evelyn **Administrative Assistant** Christina Okang **Database Assistant** Dolores Williams

Contributing Editors Frank Bican, Douglas Boling, Bruce Brown, Ray Duncan, John C. Dvorak, Mitt Jones,

Michael J. Melford, Edward Mendelson, Bill O'Brien, Charles Petzold, Alfred Poor, Jeff Prosize, Winn L. Rosch,

Jim Seymour, Richard Hale Shaw, Barry Simon, Luisa Simone, Craig Stinson, M. David Stone, Ethan Winer,

William F. Zachmann

Support Associate, PC MagNet Christopher T. Parker **Sysops, PC MagNet** Rick Ayre, Jesse Liberty

Acting Art Director Robert C. Smith **Associate Art Directors** Charles Conover, Renata Gomes, Patricia Isaza

Assistant Art Director Michael L. Graham **Associate Graphics Director** Gary W. Kaplow **Electronic**

Graphic Artists Simone Blank, David Foster, Robin L. Malik **Post-Production Artist** Genevieve Martineau

Assistant to the Director of Design Frieda T. Smallwood

Director, PC Labs C. James Galley III

Technical Director, PC Labs Robert W. Kane **Project Leaders** Richard Brady (Connectivity), Gabrielle Gagnon

(Software), Lori Grunin (Graphics), Alan M. Stoughton (PCs), Michael J. Zulich (Hardware) **Sr. Programmer**

Stuart R. Greenberg Jr. **Programmer** Bradley G. Epranian **Product Testing Manager** Charles Rodriguez Sr.

Tech. Analyst Stephen W. Plain Jr. **Tech. Analyst** Mano Baldasserini **Support Technician** Margaret A.

Piemonte **Operations Manager** John R. Delaney **Inventory Control Coordinators** Peter Bastide, Rob Graydon,

John Jones **Secretary** Ann Jo Sanchez

Publisher Ronni Sonnenberg

Director, Marketing Ellen Atkinson **Events** Stacy O'Connell **Market Information** Michael Van Engen **Sales**

Development Jeff Stanley **Subscriptions** Charles Mast **Single Copy Sales** James E. Gerth

Assistant Production Director John Ansaldi **Senior Advertising Production Manager** Vicki Egan Root

Advertising Production Manager Lori Iaccino **Advertising Production Assistants** Pam Berkowitz,

Oris D'Amil **Editorial Production Coordinators** Kevin S. Fagan, Jo-Ann Hirschel **Production Systems**

Supervisor Linda Harms **Production Systems Assistant** Lillian Gaffney

Advertising Office: One Park Ave., New York, NY 10016: 800 33 MAG AD, 212-503-5100

Subscription Problems: 800-289-0429, 303-447-9330 (outside the U.S.)

ZIFF-DAVIS PUBLISHING COMPANY

President Eric Hippelau

Executive Vice President J. Scott Briggs

Group Vice President, Mac Publications J. Samuel Huey

Group Vice President, Direct Publications Jim Stafford

Senior Vice President, Marketing Paul H. Chook

Vice Presidents Baird Davis (Operations), Howard D.

Sokolnik (Controller), Herbert Stern (Creative Services),

Manan O. White (Research), Bert Lacy (Circulation), James

F. Ramaley (Circulation Systems), Ann Pollak Adelman

(Marketing Services), Roger Herrmann (Production),

Jeff Ballows (Worldwide Direct Publications), Bill Machrone

(Technology), William L. Phillips, Claude P. Sheer, Ronni

Sonnenberg, Paul Stafford (Classified Advertising)

Executive Director, Information Systems John Helliwell

Executive Director, Ziff-Davis PC Network Tony Uphoff

Directors Steven Rosenfield (Business Development),

Jeff Weiner (Corporate Development), Jean Lamensdorf

(Licensing), Gary A. Gustafson (Planning), Walter J.

Terlecki (Production), Dan Leonetti (Sales Training),

Susan Delman (Corporate Marketing), Lewis D'Vorkin

(Editorial), Beth Springer (Ziff-Davis Labs)

Business Manager, Publishing Operations Tom

McGrade

Vice President, Controller, and Treasurer

Patrick J. Burke, Jr.

Vice President, Human Resources

Frederick K. Staudmyer

Vice President, Business Manager T.L. Thompson

Vice President, Chief Information Officer Thor Olson

Vice President, Electronic Editorial Director

Michael Kolowich

Vice Presidents Seth R. Alpert, Steven C. Feinman

ZIFF COMMUNICATIONS COMPANY

Chairman William B. Ziff, Jr.

Vice Chairman Philip B. Korsant

President Kenneth H. Koppel

Executive Vice President Philip Sine

Senior Vice President Hugh Tietjen

Vice President, General Counsel, and Secretary

J. Malcolm Morris

Editorial and Business Office: One Park Ave., New York, NY 10016 Editorial: 212-503-5255; Advertising: 800 33 MAG AD, 212-503-

5100. *PC Magazine* is an independent journal, not affiliated in any way with International Business Machines Corp. IBM is a registered

trademark of International Business Machines Corp. Entire contents copyright ©1991 Ziff-Davis Publishing Company, a division of Ziff

Communications Company. All rights reserved; reproduction in whole or in part without permission is prohibited. The following are

registered trademarks of Ziff Communications Company: PC, PC Magazine, PC Labs, PC MagNet, PC Magazine Award for Technical

Excellence, PC Magazine Editors' Choice Award. The following are trademarks of Ziff Communications Company: Abort, Retry, Fail?;

Connectivity, Databases, Direct Marketing Connection; First Looks; New and Improved, Advisor; Lab Notes; PC Marketplace; Pipeline;

Tutor; The PC Utilities; Power Programming, Power User; Read Only, Spreadsheets, User-to-User; The Working Word.

SUBSCRIPTIONS

Subscription Services: For subscription service questions, address changes, or how to order, call toll-free 800-289-0429 or write to *PC Magazine*, P.O. Box 54093, Boulder, CO 80322-4093.

Subscription Rate: The subscription rate is \$44.97 for a 1-year subscription (22 issues). Canada and all other countries, please add an additional \$32.00 for postage. GST Registration Number: R-123669673.

Back Issues: For back issues (subject to availability), \$8 per issue (\$9 outside the U.S.), send check or money order to Back Issues Department, Ziff-Davis Publishing Company, P.O. Box 53131, Boulder, CO 80322-3131.

HOW TO CONTACT THE EDITORS

The editors of *PC Magazine* want to hear from you. Please send your questions, complaints, compliments, and submissions to *PC Magazine*, One Park Ave., New York, NY 10016. Send electronic mail to MCI Mailbox 157-9301 (*PC Magazine*) or PC MagNet (see below). *PC Magazine's* general number is 212-503-5255. The West Coast Operations number is 415-378-5500. For other Ziff-Davis publications, call 212-503-3500.

We are unable to look up stories from past issues, recommend products, or diagnose problems with your PC by phone. If you bought a product advertised in *PC Magazine*, are dissatisfied, and can't resolve the problem, write (do not call) Alicia Dwek, Advertising Department, at One Park Ave. Include copies of correspondence.

PC Magazine is under no obligation to review unsolicited products. All submissions accepted for publication become the property of *PC Magazine*. We will pay \$50 for Productivity user tips and Abort, Retry, Fail? submissions. For submissions to Abort, Retry, Fail?, if you send artwork for possible reproduction, mark the funny part on a photocopy, not the original.



PC MAGNET: PC MAGAZINE'S ON-LINE SERVICE

PC Magazine operates PC MagNet, an on-line service where readers can find the utilities published in each issue, download an index of reviews, share opinions with the editors, and access *Computer Library*. To join, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest you, dial 800-346-3247. (In Canada, call 800-635-6225, voice only.) When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

After you have found the phone number, hang up and dial using the number you just found. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9000 at the ENTER AGREEMENT NUMBER prompt. CompuServe members can join by entering GO PCMAG at any CompuServe prompt. To upload a letter, type GO PCM:FORUMS. For Customer Service, call 800-848-8990. PC MagNet costs \$12.80 per hour via MasterCard, VISA, or American Express.

PERMISSIONS, REPRINTS

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use *PC Magazine's* logo in conjunction with an Editors' Choice designation, write Chantal Lavelanet; for information on reprints in quantities of 500 or more, write Claudia Crichlow.

PC MAGAZINE REVIEWS

Except where noted: All *PC Magazine* reviews are of currently available products. Comparative reviews are arranged alphabetically by product name for software, by company name for hardware. Software is free from copy protection. On benchmark test charts, shorter bars indicate faster products (less time to complete a task). Benchmark and performance tests are run on Compaq Deskpro 386/25s and 25es.



AUSTIN
REVEALS THE
POWERFUL
SECRET BEHIND
ITS RAPID
SUCCESS.

\$4248

THE DELL 333D
 64K SYSTEM CACHE, 100MB HARD DRIVE, 4MB RAM, 1 FLOPPY, 1024 X 768
 NON-INTERLACED VGA COLOR MONITOR, DOS/WINDOWS/MOUSE

ARITH

YOU DON'T NEED AN MBA FROM HARVARD, MIT, OR EVEN THE UNIVERSITY OF SOUTHERN BURMA TO UNDERSTAND WHY AUSTIN COMPUTER SYSTEMS HAS BEEN SO SUCCESSFUL. ALL YOU HAVE TO DO IS COMPARE A DELL COMPUTER TO AN AUSTIN. **BESIDES NAME TAGS. THE BIG DIFFERENCE IS PRICE TAGS.**



AUSTIN COMPUTERS ARE DESIGNED AND ENGINEERED WITH THE HIGHEST QUALITY NAME BRAND COMPONENTS LIKE INTEL MICROPROCESSORS AND MICROSOFT ACCESSORIES. SO ARE DELL'S. AUSTIN HAS A FULL LINE OF PROCESSORS FROM 286'S TO 486/50'S. SO DOES DELL.

AUSTIN HAS NEXT-DAY ON-SITE SERVICE, TOLL-FREE PHONE SUPPORT, A 30-DAY MONEY-BACK GUARANTEE, SEPARATE VAR, CORPORATE AND INTERNATIONAL DEPARTMENTS, 100% FINANCING AND SEVERAL



\$2590

THE AUSTIN 386/33 WINSTATION

64K SYSTEM CACHE, 125MB HARD DRIVE, 4MB RAM, 1 FLOPPY, 1024 x 768
NON-INTERLACED VGA COLOR MONITOR, DOS/WINDOWS/MOUSE.

METIC.

LEASE OPTIONS. DELL DOES TOO. BUT THE BIG DIFFERENCE IS DELL CHARGES YOU HUNDREDS, EVEN THOUSANDS OF DOLLARS MORE THAN AUSTIN. AND AS IF THAT ISN'T ENOUGH, AUSTIN GIVES YOU SOME



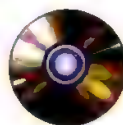
FEATURES DELL DOESN'T. LIKE HIGH-RESOLUTION, NON-INTERLACED

**TO ORDER
CALL:**

1-800-752-1577

MONITORS STANDARD ON

CD ROM FOR ONLY \$399



ALL COLOR SYSTEMS. THE OPTION OF A

ON ALL DESKTOP AND TOWER SYSTEMS.

**NON-INTERLACED
MONITORS**

AND 24-HOUR ACCESS TO OUR EXCLUSIVE ON-LINE ORDER ENTRY AND TRACKING SYSTEM VIA OUR NOV-
ELL NETWORK FOR ALL QUALIFIED BUYERS. WE'LL EVEN INSTALL YOUR OPERATING SYSTEM AND
APPLICATIONS SOFTWARE AT NO CHARGE. **AUSTIN COMPUTER SYSTEMS**



IT ALL A

ALL THE EXTRAS NO EXTRA CHARGE AUSTIN WINSTATIONS COME COMPLETE WITH MS-DOS, MICROSOFT WINDOWS 3.0, AND A MICROSOFT MOUSE. NOT SOME STRIPPED DOWN CHASSIS THAT'S AS USEFUL AS A PAPERWEIGHT. WE'LL EVEN CUSTOM BUILD YOUR SYSTEM. YOU PICK THE VIDEO, HARD DRIVE, RAM SIZE, PERIPHERALS. **WHY THE EDITOR'S CHOICE SHOULD BE YOURS** WE COULD GO ON FOREVER ABOUT

OUR FOUR EDITOR'S CHOICE AWARDS OR ABOUT HOW GREAT AUSTIN SYSTEMS ARE, BUT WE'LL LET THE EXPERTS DO IT FOR US: "THE AUSTIN, TEXAS-BASED COMPUTER SELLER HAS GARNERED PC MAGAZINE EDITOR'S CHOICES AS IF THE AWARD HAD BEEN CREATED FOR IT." PC MAGAZINE "TOP



NOTCH COMPONENTS, SOLID PERFORMANCE, TERRIFIC SUPPORT AND A LOW PRICE, MAKE IT A MACHINE THAT IS HARD TO BEAT." PC MAGAZINE **WE MAKE HOUSE CALLS** MOST COMPANIES BURN IN JUST THEIR

OF NEEDING OUR G.E. ON-SITE SERVICE IS LOCAL SUPERMARKET. BUT IF ANYTHING WE'LL BE AT YOUR DOOR USUALLY WITHIN



ABOUT AS SLIM AS SPOTTING ELVIS IN YOUR DOES GO WRONG DURING THE FIRST YEAR, 24 HOURS. YOU DON'T PAY FOR PARTS. OR

LABOR. OR EVEN THE CALL. WE ALSO OFFER EXTENDED SERVICE UP TO FIVE YEARS. AND OUR TOLL-FREE TECHNICAL HOTLINE IS THERE FOR YOU IF YOU EVER NEED IT. **LEASE IT FINANCE IT DO IT** NOT A ROCKE-

FELLER, GETTY, OR GATES? NO PROBLEM. YOUR BUSINESS CAN LEASE AN AUSTIN AT RATES EVEN A

TO ORDER CALL:
1-800-752-1577

VAR 1-800-338-1569 OVERSEAS (512) 339-3500
GOVT 1-800-833-4472 NETWORKING 1-800-874-7182
FAX (512) 454-1357 CANADA 1-800-338-1565
FORTUNE 1000 1-800-622-5506

TRUMP COULD AFFORD. OR YOU CAN APPLY FOR OUR LOW INTEREST RATES, LOW PAYMENTS, AND 100% FINANCING.

MONEY-BACK GUARANTEE TRY AN AUSTIN FOR 30 DAYS. IF YOU'RE NOT ECSTATIC WITH IT, SHIP IT BACK. NO QUESTIONS ASKED.

ALL THIS SOUND GOOD? THEN CALL US NOW AT 1-800-752-1577 FOR OUR LATEST PRICES. OR CALL OUR VAR, GOVERNMENT, CORPORATE, INTERNATIONAL, OR OUR



NETWORKING DEPARTMENTS AND WE'LL TELL YOU ABOUT OUR NEW VOLUME DISCOUNT PROGRAMS.

BECAUSE WHEN YOU ADD UP THE QUALITY, PERFORMANCE, SERVICE, MONEY-BACK GUARANTEE AND COMPETITIVE PRICES YOU GET WITH AUSTIN, WE THINK YOU'LL AGREE WITH PC MAGAZINE

WHEN THEY SAID, "HOW CAN YOU LOSE?"

AUSTIN COMPUTER SYSTEMS



DDS UP.



AUSTIN 286/16 \$940

Microprocessor: 286 running at 16MHz
Storage: 40Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 1Mb RAM
Video: TTL Monochrome



AUSTIN 386/SX16 WINSTATION \$1190

Microprocessor: 386/SX running at 16MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 386/SX20 WINSTATION \$1240

Microprocessor: 386/SX running at 20MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 386/25 WINSTATION \$1390

Microprocessor: 386 running at 25MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 386/SX20 NOTEBOOK \$2195

Microprocessor: 386/SX running at 20MHz
Special Features: Under 8 lbs with battery. Battery and recharger included
Storage: 40Mb IDE Hard Drive, 1.44Mb FDD
Memory: 2Mb RAM
Video: 10" VGA LCD Display with 640 x 480 Resolution and 32-Gray Scale
Keyboard: Full size embedded numeric pad with 12 function keys



AUSTIN 386/33 WINSTATION \$1590

Microprocessor: 386 running at 33MHz, 64K System Cache
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 486/SX20 ISA WINSTATION \$1790

Microprocessor: 486/SX running at 20MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 486/33 ISA WINSTATION \$1990

Microprocessor: 486 running at 33MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 486/33 EISA WINTOWER \$2990

Microprocessor: 486 running at 33MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome



AUSTIN 486/50 EISA WINTOWER \$3990

Microprocessor: 486 running at 50MHz
Special Features: Pre-loaded with Microsoft Windows 3.0, MS-DOS and a Microsoft Mouse
Storage: 40 Mb IDE Hard Drive, 1.44 or 1.2Mb FDD
Memory: 2Mb RAM
Video: TTL Monochrome
Call for exact shipping date

VISIT US AT COMDEX.

FALL '91, SANDS EXPO AND CONVENTION CENTER, BOOTH S1089

FOR OTHER OPTIONS OR TO ORDER CALL: 1-800-752-1577

10300 METRIC BLVD., AUSTIN TX 78758

© 1991 Austin Computer Systems. All Rights Reserved. Dell is a registered trademark of Dell Computer Corporation. Pricing and specs confirmed by Dell Computer Corporation, August 28, 1991. Other product names or trademarks shown herein are for illustrative purposes only and may be the property of other companies. Prices and specifications are subject to change without notice. Austin Computer Systems cannot be responsible for errors in typography or photography. There is no annual fee or minimum charge required for the Austin Computer Systems credit card and the annual percentage rate is 17.88%.

Ad Code #PC-1191

CIRCLE 509 ON READER SERVICE CARD

Nobody Delivers like Dustin

At Dustin, we are committed to providing our customers with Premium Service at the lowest available price. Our sales staff is dedicated to answer your call in three rings or less. And, with one of the largest inventories in the industry, we are able to send out over 90% of our orders on the same day they're placed. That's the Dustin Difference.

THE DUSTIN DIFFERENCE:

- Free Ground Shipping ✓
- Same Day Shipping ✓
- Overnight Delivery Available ✓
- Corporate PO's Welcome ✓
- AP0's & FPO's Welcome ✓
- 24-Hour FAX Order-Line ✓
- Government & Educational Pricing ✓
- No Minimum Orders ✓
- Visa, MasterCard, & AMEX Accepted ✓
- No Credit Card Charges Until Shipping ✓
- No Credit Card Surcharges ✓
- Thousands of Items in Stock ✓
- The Latest Software Versions for your PC ✓
- Manufacturers' Warranties & Documentation ✓
- Call for Items Not Listed & Free Catalogue ✓

ACCOUNTING/FINANCE

ACC PAC BPI 255.
DAC Accounting 95.
DAC Bonus Pack 139.
Managing Your Money 139.
Moneycounts 35.
One Write + Paccioli 179.
Peachtree III 39.
Peachtree III w/DQ 159.
Quicken 4.0 235.
Timeslips III 45.
Timeslips III 205.

BORLAND

Borland C++ 329.
Objectvision 99.
Paradox 3.5 525.
Paradox Engine 99.
Paradox Multipak 659.
Paradox Upgrade 159.
Quattro 75.
Quattro Pro 3.0 319.
Quattro Pro 3.0 Upgrade 129.
Reflex 2.0 175.
Sidekick 2.0 69.
Sprint 149.
Turbo C++ 2nd Edition 75.
Turbo Debugger & Tools 95.
Turbo Pascal 6.0 109.
Turbo Pascal Windows 159.

BUSINESS GRAPHICS

ABC Flowcharting 195.
Calendar Creator Plus 49.
Charisma 2.1 345.
Dan Bricklins Demo II 179.
Draw Perfect 285.
Easy Flow V7.0 165.
Flowcharting III 149.
Form Filler 95.
Form Tool Gold 3.0 65.
Freelance Graphics 345.
Graph in the Box 79.
Harvard Graphics 3.0 345.
Hijaak 109.
Impress 2L 85.
Inset + Hijaak 149.
ORG Plus Advanced 75.
Perform Professional 305.

CAD/DRAFTING

3D Drafting 219.
Autosketch 3.0 159.
Design CAD 159.
Design CAD 3D 209.
Drafix For Windows 445.
Drafix Ultra 259.
Generic CADD 5.0 299.
TurboCAD 85.

COMMUNICATION

ADV Network 286 2039.
BiModem 55.
Carbon Copy + 6.0 125.
CO Session 125.
Crosstalk Communicator 65.
Crosstalk Mk IV 145.
Crosstalk Windows 129.
Dynacom 215.
ELS Level II 2.15 1169.

Fast Lynx
Laplink III
PC Anywhere III
PC Anywhere IV
Procomm Plus 2.0
Reflections 4+
Smartcom Exec
Smartterm 240
Softterm PC

DATABASE

Access SQL 429.
Ask Sam 5.0 229.
Biz*Base Personal 49.
Clarion Personal 55.
Clarion Professional 499.
Clipper 5.01 509.
Codebase IV 265.
Data Perfect 2.2 309.
DB Fast Windows 229.
DBase IV 519.
DBase IV Developers 859.
DBXL 149.
Foxbase + 199.
Foxbase + 386 305.
Foxbase + Lan 305.
Foxbase +

Lan Runtime 349.
Foxpro 2.0 485.
Foxpro Lan 2.0 799.
Foxpro Runtime 295.
Nutsell-II Promo 155.
Paradox Engine 99.
PC File 6.0 89.
Personal R:Base 85.
Q & A 285.
R Base 3.1 479.
R/R Report Writer 159.
SCO Foxbase 659.
Superbase 4 439.
Thinx 319.
WindowBase 149.

DESKTOP PUBLISHING

Adobe Fonts Call.
Adobe Illustrator 319.
Adobe Plus Pak 129.
Adobe Streamline 249.
Adobe TypeAlign 75.
Adobe Type Manager 69.
Adobe Typesets 1.2.3 89.
Artline 2.0 389.
Catchword 149.
Corel Draw 2.0 389.
Deluxe Paint II Enhanced 89.
Designer 469.
Express Publisher 99.
Facelift 69.
First Publisher 99.
Fantasy 3 69.
Freedom Of The Press 259.
Graphics Editor 415.
Grasp 4.0 205.
OmniPage 386 459.
PageMaker 4.0 509.
PC Paintbrush IV + Pizazz 125.
Printmaster Plus 75.
Printshop 45.
Publish It 1.2 145.

Publishers Type Foundry 319.
Readright Windows 319.
Scrapbook Plus 99.
The Animator 269.
Ultra Script PC Plus 265.
Ventura Gold 3.0 499.

EDUCATION TRAINING

French Assistant 45.
German Assistant 45.
Italian Assistant 45.
Learning DOS 45.
Learning German 95.
PC Bible Study 89.
Spanish Assistant 49.
Where is Carmen? 39.

HARDWARE

Hayes ESP PS/2 265.
Hayes ESP AT/Xt 229.
Okidata Printers Call.
Toshiba Laptops Call.

INFORMATION/PROJECT MANAGEMENT

ACT 229.
Address Book Plus 55.
Agenda 2.0 305.
Current 235.
Desktop Set 95.
Grandview 205.
Harvard Project Manager 455.
Idea Fisher 359.
Info Select 2.0 99.
On Target 275.
Plan Perfect 249.
Project Mgr Workbench 825.
Project Scheduler V 465.
Timeline 4.0 439.

INTEGRATED

First Choice 95.
Framework III 465.
Lotus Works 99.
Open Access III 409.
Smartware II 469.
Symphony 2.2 525.
Word Perfect Office 99.

KENSONGTON

Expert Mouse 109.
Keyboard Shelf 45.
Masterpiece+ 115.

MATHEMATICAL

Derive 159.
Mathmatica 386/387 789.
Mathcad 325.
Math Type PC 175.
SPSS/PC + 179.
Statgraphics 5.0 665.
Sigma Plot 475.
Plot It 359.

MICROSOFT

MS Basic 7.1 329.
MS C Compiler 329.
MS Chart 269.
MS Dos 3.3 69.
MS Dos 4.01 69.
MS DOS 5.0 79.

MS DOS 5.0 Upgrade 69.
MS Excel 3.0 329.
MS Fortran 309.
MS Macro Assembler 109.
MS Mouse with Paint 95.
MS Mouse with Windows 169.
MS Multiplan 135.
MS Office Windows 659.
MS Project 339.
MS Project Windows 465.
MS Quick Basic 75.
MS Quick C 75.
MS Windows 3.0 99.
MS Windows Dev Toolkit 339.
MS Word 5.5 229.
MS Word Windows 335.

OPERATING SYSTEMS

Desqview 85.
Desqview 386 139.
DR DOS 145.
DR DOS Multi 449.
DR DOS 5.0 Upgrade 79.
Geoworks 135.
MS DOS 5.0 79.
MS DOS 4.01 89.
OS/2 Pres Mgr Toolkit 339.
OS/2 Standard 145.
PC DOS 4.01 135.
PC DOS 5.0 139.
PC MOS 5.0 User 435.
SCO VP/IX 345.
Unix 386 Development 699.
Unix 386 Operating 689.
VM 386 Multi User 575.
Xenix 386 Operating 549.

PROGRAMMING

Actor Professional 485.
APL Plus 449.
Brief 185.
Case PM 1859.
Clear + For C 135.
Halo 88 MS C 259.
Owl Guide 389.
RM Cobol 85 789.

Smalltalk V286 125.
Smalltalk VPM 299.
Smalltalk Windows 285.
Toolbook Windows 305.
Turbo C Tools 125.
Turbo Professional 115.
UI Programmer 345.

SPREADSHEETS

Baler 359.
Lotus 123 ver. 2.2 349.
Lotus 123 ver. 2.3 349.
Lotus 123 ver. 3.1 419.
MS Excel 3.0 329.
Quattro 75.
Quattro 3.0 319.
Quattro 3.0 Upgrade 129.
SCO Professional 645.
Supercalc V 109.
Wingz PC 329.

UTILITIES

386 Max 5.1 79.
Above Disk 69.
Always 119.
Auto Menu 45.
Becker Tools 89.
Blue Max 95.
Brooklyn Bridge 95.
Check It 69.
Command Post 49.
Control Room 79.
Copy II PC 35.
Copywrite 69.
Cubit 45.
Direct Access 69.
Disk Technician Gold 45.
Fastback Plus 3.0 109.
First Apps 119.
Headroom 59.
Icon Designer 75.
Intelligent Back-Up 39.
K Edit 109.
Mace 1990 115.
Magellan 99.
Menu Works 115.

MKS Toolkit 225.
Movem 59.
Netroom 59.
Norton Utilities 6.0 119.
Norton Back-Up 105.
Norton Commander 105.
Norton Editor 75.
Option Board Deluxe 119.
PC Kwik Powerpack 79.
PC Tools Deluxe 7.0 109.
PK Zip 49.
Print A Plot 195.
Print Cache 115.
Q Dos III 55.
QEMM 386 69.
QRAM 55.
Resource Toolkit 139.
Scrapbook+ 99.
Sideways 65.
Software Bridge 85.
SPF/PC 155.
Spirrite 2 69.
Turbo EMS 59.
Virex PC 85.
Windows Express 59.
Wonder Plus 55.
XTree Pro Gold 2.0 99.

WORD PROCESSING 299.
AmiPro for Windows 119.
AmiPro Upgrade 85.
Just Write 139.
Letter Perfect 339.
Manuscript 289.
Multimate 4.0 339.
Nota Bene 175.
Professional Write+ 65.
Rightwriter 4.0 39.
Typing Tutor 79.
Word For Word Pro 259.
Word Perfect 5.1 225.
Wordstar 6.0 225.

Call For Any Item Not Listed



Plain Wrap Prices,
Black Tie Service.

20969 Ventura Blvd., Suite #13, Woodland Hills, CA 91364
(818) 710-9174

Call Toll Free from anywhere in the United States
Monday thru Friday - 7:00AM to 5:00PM PST

1-800-274-6611

Or Fax It!

1-818-884-5310

We will promptly replace any defective items returned within 30 days, but cannot guarantee compatibility. There is a 15% restocking fee on any non-defective, unopened goods, and all returns must be accompanied by a Returned Merchandise Authorization. Software prices do sometimes fluctuate beyond our control and may change, for better or worse, without notice. While ground shipments are free, we do ask \$11.00 per item for 2-day, \$22.00 per item for overnight, and \$4.50 for C.O.D. Although shipping heavier items may be slightly more, bulk orders can be a lot less. Free catalogues are available upon request, and please call us for any item not listed.

Letters

CALL 1-900-SUPPORT

In your July 1991 issue ("For a Good Time, call 1-900-SUPPORT"), William Zachmann writes that customer support should be paid for by the "basic prices of their products." The cost of software is already so high that some people are forming cooperatives to buy a single registered copy of the software.

I don't think it is out of line to ask customers who want an extra service to pay an extra charge. The rest of us should benefit from lower software prices. Let's keep 900 numbers a part of customer support.

Mac Salfen
Arlington, Texas

The thrust of Mr. Zachmann's theme seems to be that the software developer is to blame for producing software that needs support. While he is correct that well-designed applications *should* not need much support, the fact is that there are many users who use free support lines for basic computer instruction.

Mr. Zachmann needs to spend some time on a support line to see how frustrating it is to answer question after question, each of which the manual clearly spells out. Free support encourages users to use support lines instead of looking in the manuals.

Pay-per-call support lowers the total cost of support for everyone because the end users research the manual before they call, and the novices go elsewhere for basic computer instruction.

Ken Mocabee, President
Advanced Support Group Inc.
Des Peres, Missouri

If you were like me and fully read the manual, you probably wouldn't need all that support. In this case, a 900 number would be more logical, as you would only be paying for the support you use, and no more.

Michael P. Zier
Smallwood, New York



The readers are in agreement: 900 numbers are a good idea.

PRIVACY COUNTS

I also exercise the option of *not* providing information to potential data collectors (see Jim Seymour's column "PCs and Privacy Issues," August 1991), with this slight variation: Instead of leaving things blank, I write "Noydb" (none of your damned business) or "704-1776" in the blanks asking for personal information. The originator of the form probably won't get the reference to what happened in July 1776.

Not only do these techniques pass the usual level of scrutiny, they also avoid long discussions with officious or well-intentioned employees. (Perhaps Mr. Seymour enjoys those encounters.)

Martin R. Vissers
Carrollton, Texas

INNOVATIVE SOFTWARE

I don't understand how Jim Seymour could devote two columns to "the nature of innovation in the software business" (June 25, 1991, and July 1991) and not mention some new products that qualify as truly innovative and revolutionary.

You gave *IdeaFisher* ("Brainstorming

Software: A Free Flow of Ideas," April 30, 1991) an Editors' Choice award and called it "a program with massive proportions." You also said there's "nothing out on the market quite like it." *IdeaFisher* represents exactly the new kind of product Seymour laments over. I hope he can track down the review, read it, and see the future. Déjà vu, Jim.

Matt Engen
Laguna Beach, California

In the past, I have agreed with just about every opinion Jim Seymour has published in your magazine. However, his last article, "Why Software Innovation is Lagging," July 1991, has set him back to the Dark Ages. According to him, businesses should not bother asking the consumers what they want; instead, they should create some wild, innovative product and assume that people will run to buy it.

Anyone who has dealt with profit and loss, especially in a down economy, knows that this approach is incredibly stupid and naive. *Not* asking what customers want gets a business into trouble. If Seymour ever becomes head of product development for any company, I want to be informed so that in case I own stock, I will have time to sell it.

John E. Johnson, Jr.
Redwood City, California

IN LIMBO IN APO

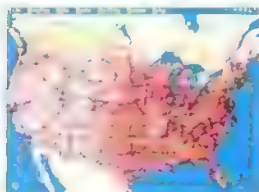
I just lived in Europe for six years and would like to point out to "In Limbo in APO" (Letters, May 28, 1991) that it is possible to dial 800 numbers from overseas: You just need an AT&T calling card.

After contacting the U.S.A. direct operator for your country, ask for the 800 number desired and provide your AT&T calling-card number. The only problem is that the 800 number must be AT&T-assigned—although in the time I used the system, I only encountered one or two non-AT&T numbers.

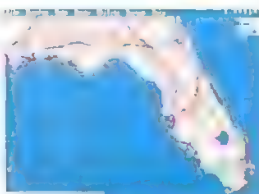
David L. Breen
Fort Huachuca, Arizona

AUTOMAP™

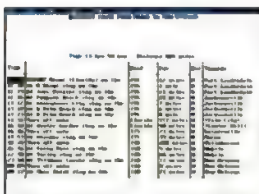
The Intelligent ROAD ATLAS™



The fun, fast, friendly way to know before you go. Full color maps help you plan your best route. Accurate, current and reliable data.



AUTOMAP's powerful intelligence searches over 350,000 miles of road and more than 50,000 cities.



Print out detailed maps and directions to take along with you. AUTOMAP can easily save up to 20% in driving time and costs.



DUSTIN

DISCOUNT SOFTWARE

ONLY \$59

Plain Wrap Prices,
Black Tie Service.

1-800-274-6611

29904 Venture Blvd., # 13, Woodland Hills, CA 91364 (818) 710-9174
Price subject to change without notice

Letters

ABOUT THAT AUTOEXEC COLUMN...

In response to Letters, June 25, 1991: Is Bill Seixas a closet Psychoanalyst.BAT? There are more disturbed CONFIG.SYS and AUTOEXEC.BAT owners out there than is safe or desirable. The idea of asking why anyone would do what they have done and devoting an entire column to this topic could be as amusing as "America's Funniest Home Videos."

I will not be the first to supply an example.

Jef Fowler
Fairhaven, Massachusetts

WHAT HAPPENED TO WINDOWS?

The July issue of your magazine appears to be the second of the last three issues without the word *Windows* anywhere on the cover. I say "appears" because this seems impossible. We all know that these days a major computer magazine can't publish without a plug for *Windows* on the cover; it would be like a whole Sunday *New York Times* without a single mention of Madonna.

I thought you might have buried the magic word somewhere in the artwork, like the illustrations in children's books challenging the reader to find the tigers in the foliage. No luck, however. Okay, guys, I give up: Is it in the bar code?

John D. Hack
New York, New York

UNDEREQUIPPED LAPTOPS?

In your July Letters column, reader Eric Severn says he doesn't understand why notebook manufacturers mate only 1MB of RAM and a 20MB hard disk with a powerful 386SX.

It's just another version of "bait and switch." The manufacturers know we can't operate with only 1MB and a 20MB hard disk, but they configure the machines that way so they can advertise enticingly low prices. They have us captive; since they are the only ones who can install the hard drives and the extra RAM, they can charge outrageous upgrade prices.

My laptop or notebook purchase will go to the manufacturer who offers a reasonable price along with the right configuration. Until then, I'll do without one.

E. Wayne Gibson
Rocky Mount, North Carolina

THE COMPUTER PSYCHIC

Even if the IBM-Apple alliance bears fruit, it will be several years before anything hits the shelves. Meanwhile, allow me to predict the situation a single year from now.

Microsoft will be trumpeting OS/2 3.0, renamed OE/NT, and explaining that *Microsoft Windows 3.1* is appropriate only for 286s. *Windows 3.2* won't be mentioned.

OS/2 2.0 will have modest success in the general marketplace and significant

Anyone who goes to meetings could use a 1- to 2-pound computer with a real keyboard and a simple DOS word processor.

success in displacing *Windows* in the corporate world.

Most of the "PC experts" of the trade press will still not understand elementary decades-old concepts such as preemptive multitasking and overlapped I/O. They will continue to base technical excellence ratings on screen prettiness.

Wayne Johnson
Becker, Minnesota

PALMTOPS MISS THEIR MARK

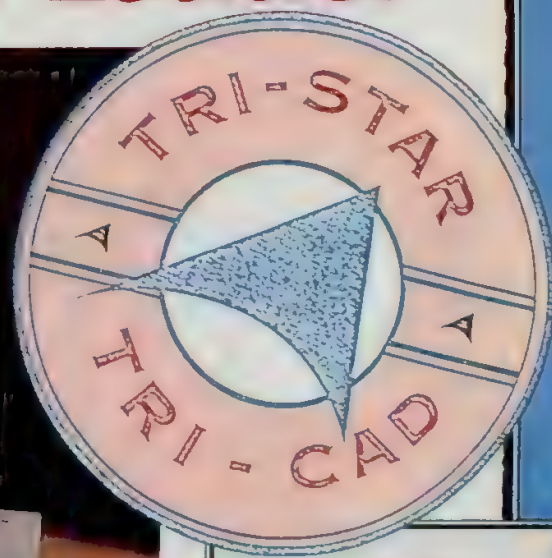
Palmtop manufacturers are missing an entire market ("Palmtop PCs: Power by the Ounce," July 1991). You can't really touch-type on any of them. Anyone who goes to meetings, conferences, or even college could use a 1- to 2-pound computer with a real keyboard and a simple DOS word processor. Two fingers just don't hack it when you want to type that brilliant idea before you forget it, or when you're trying to keep up with a speaker.

J. Grady Cash
Omaha, Nebraska

WHEN BAD REVIEWS HAPPEN

I don't see why *PC Magazine* should apologize to vendors when it makes product-review errors (Bill Machrone's "When Bad Reviews Happen to Good Products"

Student Body Leader



ADVANCED FEATURES INCLUDE:

- Intel 80486 Processor with Integrated 8K Cache & Math Coprocessor
- 8MB of High Speed 32-Bit RAM
- 64K High Speed Static RAM Cache
- 210MB 15ms Hard Disk Drive
- 1.2MB 5.25-inch Floppy Drive
- 1.44MB 3.5-inch Floppy Drive
- 1MB 1024 x 768 SVGA Graphics Adapter
- 17" Non-Interlaced SVGA Flat Color Display
- Microsoft DOS 5.0
- Panacea CAD Display List Driver
- 101-Key Tactile Keyboard
- 2 Serial Ports & 1 Parallel Port
- 12" x 12" Digitizer w/Cordless 16 Button Puck
- FastCAD Design and Drafting Software

Tri-CAD workstations are the hands-down choice of the world's leading CAD training schools and Universities. Schools such as the University of Texas and the world's largest CAD training center - The CAD Institute, insist on Tri-CAD quality.

Whether you're looking for twenty CAD workstations or for your first CAD workstation, Tri-CAD from Tri-Star is the right decision. Tri-Star Computer Corporation is the world's leading manufacturer of turnkey CAD workstations. We designed the Tri-CAD family of workstations with one goal - to build the best CAD workstations available anywhere, at any price.

And now for a limited time, every Tri-CAD workstation includes FastCAD - the fastest CAD in the microcomputer world.

TRI-CAD WORKSTATIONS

486/33 ISA
\$4395

486/33 EISA
\$4895

UPGRADES:

12" x 17" DIGITIZER \$255
1280 x 1024 GRAPHICS ADAPTER \$995
21" FLAT SCREEN COLOR DISPLAY \$995
330MB SCSI HARD DRIVE \$655

*"Tri-Star is king of the
33MHz 486 Mountain."*

PC WEEK
Analyst's Choice
February 18, 1991

ALL TRI-CAD COMPUTER SYSTEMS INCLUDE

- 2 Year Parts & Labor Warranty
- 60 Day Money Back Guarantee • 12 Month On-Site Service • Overnight Parts Replacement
- Lifetime Toll-Free Technical Support

TRI-STAR
COMPUTER CORPORATION

1.800.678-2799

120 South Weber Drive, Chandler, AZ 85226

Tech Support 1.800.688.8324

Telephone 602.829-0584

Fax 602.345.0110

Monday - Friday 6:00am-6:00pm PST

Saturday 8:00am-3:00pm PST

All prices and specifications subject to change without notice. We accept MasterCard, Visa & Discover (No Surcharge). AMEX (3% Surcharge), or COD. University & Corporate PO's are welcome. (1%10.00 per 25). Money back guarantee does not include shipping charges. On-Site service available in most U.S. locations. 2 Year Warranty includes system and keyboard; non-Tri-Star assembled peripheral items such as printers and monitors are covered for 1 Year. All systems have been verified or tested to comply with part 15 of the FCC rules for a Class A or Class B computing device. FCC Class A systems not intended for home use. FastCAD is a registered trademark of Evolution Computing. 386 & 486 are trademarks of the Intel Corporation. Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies.

Why Some Communications Software Don't Talk Real Good.

Something isn't quite right in the world of PC communications...

Too many comm programs have far too few emulations and protocols. Others demand big bucks for more emulations and protocols than you could use in a lifetime. A lot of programs are simply shareware in a box.

Many come from such small companies that the tech support is less than supportive.

There's even one surprisingly well-known comm package which completely shuts up the minute you attempt a high-speed file transfer.

No Size Fits All.

To cap it all off, an appalling number of software manufacturers will tell you—with a straight face—that a single, “one

size fits all” product is going to solve every communications need for every individual in every situation. Well it won't. We know. We invented the category.

All In The Family.

More importantly, we've developed the only truly workable solution for all the PC communications requirements out there. But it's not a disk.

It's a family. A family of communications solutions that's gone beyond Crosstalk® XVI and now ranges from high powered “programmers” programs to economical executive models. To Windows™ software. To remotes.

Best of all, the family works so well together that you can mix and match certain Crosstalk products to tailor-make your own communications solution. Get that mix just right—and you're looking at major cost savings.



Top Talkers

Compare the "stars" from *Software Digest*.

- ★★★★ Crosstalk Mk.4
- ★★★★ HyperAccess/5
- ★★★★ Mirror III
- ★★★★ Smartcom Exec
- ★★★★ Crosstalk for Windows
- ★★★★ Smartcom III
- ★★★ Procomm Plus

Look Who's Talking.

Take Crosstalk Mk.4 and Crosstalk Communicator. In the hands of a programmer, Crosstalk Mk.4 can perform miracles. After all, it has the CASL™ scripting language (a powerful programming language like C or Pascal). Plus, highly specialized emulations (from VT emulators to FTTERM). Data transmission rates up to 115,200bps. Multiple sessions. Modem sharing on LANs. The list goes on. With capabilities like that, you're able to create the kind of scripts programmers write home about.

Yet—and this is the amazing part—a company executive or salesman or secretary can run that very same script on economical, easy to use Crosstalk Communicator.

And while Crosstalk Communicator is the ideal complement to Crosstalk Mk.4, it's a powerful little package that can also fly solo. It's simple enough to configure in three minutes, yet supports virtually all modems plus direct connections. It has a Learn feature. The most popular protocols and emulations. Even preconfigured log-in scripts for information services and BBSs that can get you on-line with a single keystroke. Calls to other systems like a VAX® are made with surprisingly little set-up. In fact, the built-in diagnostics of Crosstalk Communicator "intelligently" aid all your installation and set-up for calls.

“Crosstalk Mk.4 “does almost everything and does it right.”
“Crosstalk Communicator...for the price, it's hard to beat.”
“...Crosstalk for Windows is a sure bet.”
—PC Magazine (April, 1991)

Crosstalk Even Opens Windows.

Since Crosstalk for Windows is a *true* Windows product, you can take full advantage of capabilities like multi-tasking. In other words, you can work on a spreadsheet while Crosstalk for Windows is calling Dow Jones News/Retrieval® in the background. Then, you can cut and paste that Dow Jones information into your document, or import it transparently through DDE, Dynamic Data Exchange. Like Crosstalk Mk.4, Crosstalk for Windows also runs on LANs. And since it combines the flexibility of Windows with the engineering excellence of Crosstalk, *Software Digest* calls Crosstalk for Windows the “best of the graphical communications packages.”

Remote, Yes. Alone, Never.

Crosstalk solutions even extend to remote computing. Remote2® gives you all the performance that made it the *PC Magazine* “Editors’ Choice.” Not only is it a remarkably straightforward and economical package, it's also a fully fledged member of the Crosstalk family. It even has the same helpful dialing directory that's in Crosstalk Mk.4 and Communicator. Not to mention the same outstanding support and back up that have made Crosstalk the only total solution for PC communications.

Get your free reprint of PC Magazine's comm software round-up (incl. tests on communications over high speed modems). Call 1-800-348-DCA-1, ext. 82A.



Just Say The Word.

Sure, a lot of comm software “don't talk real good.” But then, a lot of comm software isn't Crosstalk. So, find out how Crosstalk can overcome your communication gaps. All you have to do is call.

1-800-348-DCA-1, ext. 82A.



Another Communications Solution From DCA®

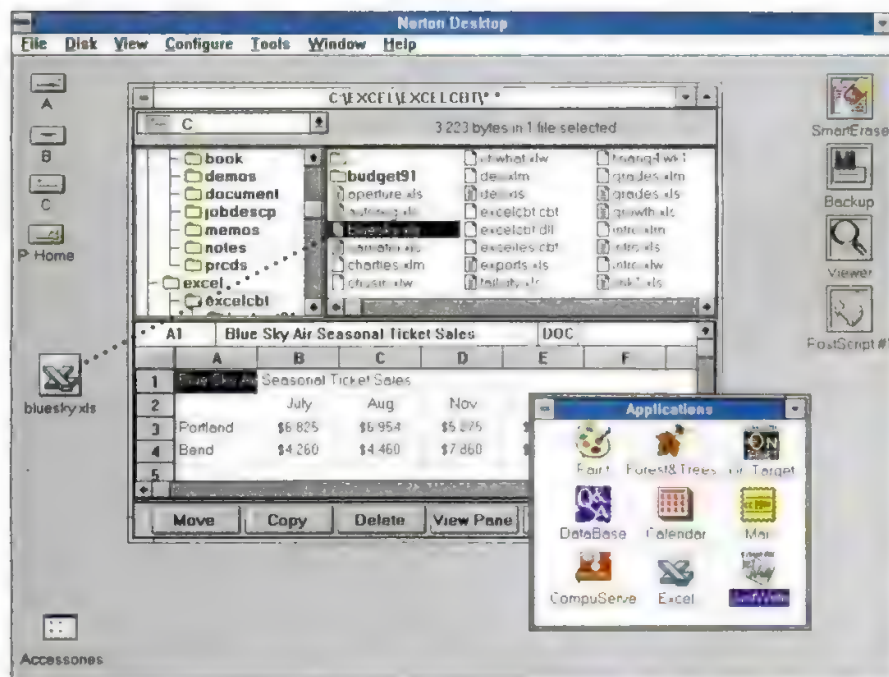
© 1991 Digital Communications Associates, Inc. All rights reserved. DCA, Crosstalk and Remote2 are registered trademarks and CASL is a trademark of Digital Communications Associates, Inc. All other brand and product names are trademarks or registered trademarks of their respective owners. Reprinted from Software Digest Ratings Report, Vol. 7, No. 12. PC Labs test reprinted from PC Magazine, April 30, 1991, Vol. 10, No. 8.



SEE US AT COMDEX
BOOTH #828

CIRCLE 278 ON READER SERVICE CARD

EVER HAPPENED TO WINDOWS.



The Norton Desktop integrates a file manager and program manager into one seamless desktop.

THE NORTON DESKTOP™
FOR WINDOWS.™

Now you can make Windows perform the way you've always wanted—without changing the way you use it. Because The Norton Desktop is the perfect companion for Windows.

For starters, you can move your programs and file groups from the confinement of the Windows Program Manager to the freedom of The Norton Desktop. It's like having your file manager and program manager transparently integrated—all for just \$149*!

The Norton Desktop's enhanced file manager allows you to launch, copy, move, view and delete a file or application by clicking and dragging icons on the desktop. You can also print documents by dragging files to any printer icon. In fact, our icon editor makes it easy to select any of

***"We took one look at
The Norton Desktop for Windows,
and it instantly became the
way we'll compute in Windows
from now on."***

—PC Computing, August '91

the more than 150 icons provided, while The Norton Viewer enables you to instantly view files from over 30 Windows and DOS applications.



Norton Backup

Not only does the Norton Desktop make sure your files are well managed, it also ensures they're well protected.

We've included The Norton Backup™ for Windows,** one of the fastest, most reliable backups you can buy. You can easily set-up automatic backups for any time of the day or night, whether you're present or not, and backup in the background, even to and from network drives.

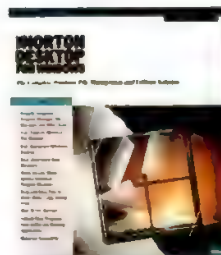


Peter Norton

And The Norton Desktop provides the easiest UnErase™ ever, for stand-alone PCs and network systems, plus the industry's most powerful automatic disk diagnosis.

It also includes a rich assortment of screen savers, along with our SuperFind™ text searching, enabling you to quickly search and find files on any disk drive—even on networks.

So if you're ready to improve your Windows, visit your nearest dealer or call **1-800-343-4714, Ext. 722P** for more information about the Norton Desktop. It could be the best thing that ever happened to your PC.



SYMANTEC.

* Suggested retail price, USA only. ** Also available separately for \$129 (MSRP). © 1991 Symantec Corporation. All rights reserved. The Norton Desktop for Windows is a trademark of Symantec Corporation. All other brand or product names mentioned are trademarks of their respective holders.

Letters

column, July 1991). Even with computers, we all make mistakes.

It seems a short-sighted attempt to placate vendors and advertisers. Surely, if one is to make errors at all, it is better to make errors of this kind than to make the mistake of recommending lemons.

If the product is any good, word of mouth will change the perception and increase sales, albeit slowly. That may hurt manufacturers in the short run, but you don't aim to please *them*, do you?

Peng H. Ang

East Lansing, Michigan

■ A NEW AGE IN MARKETING

The advent of the 486SX chip from Intel marks the beginning of a new age of marketing in the United States. With one stroke of genius, Intel has opened the door to an amazing variety of products for the American consumer. Can't afford the Jaguar of your dreams? No problem. A Jaguar SX is a couple of sledgehammer blows away. The arrival of SX tires should add a new dimension of driving excitement. The possibilities here are endless.

With this type of marketing strategy, I expect the Japanese to take over our computer industry in a few years.

John E. Cerullo

New Canaan, Connecticut

■ MAINSTREAM MONITORS

The Editors' Choice in "Mainstream Monitors: What Really Matters," July 1991, left me confused. The reviews favored products without clear technical reasons and punished others in a like manner.

The cover of your magazine suggested that the Editors' Choice Sony CPD-1304 Multiscan HG was worthy to topple the NEC MultiSync's dominance. In the Sony review, there were a great number of positive adjectives used, but I found an inconsistent amount of negative information as well, summed up by the statement, "Although Sony's CPD-1304 did not fare well on our tests, it provided one of the very best images we saw."

The inconsistency in tone was most evident when we look at the handling of the 72-Hz "flicker free" issue. Monitors that supported less than the 72-Hz vertical refresh rate for 800 by 600 were split into two camps: Half were berated for their flicker-prone designs, while the other half

were given careful treatment with regard to 72-Hz deficiencies.

Your review was overly harsh.

Conrad A. Maxwell

Senior Product Manager

Samsung Information Systems

San Jose, California

■ NO FAN OF DOS 5.0

Your July 1991 issue hails Microsoft's release of MS-DOS 5.0 as "a red-letter day for over 50 million users of IBM-compatible PCs."

Before I installed MS-DOS 5.0, I was successfully using (with MS-DOS 3.3) such obscure programs as *WordPerfect*, *PC Tools*, *Norton*, *DESQview*, and others.

Now these programs are at war with each other and with MS-DOS 5.0 itself: stack-overflow messages, lockups, system crashes, incompatibilities. One would think that with all of Microsoft's talent, a bit more attention could have been given to assuring full downward compatibility with the many popular software programs that were written for MS-DOS 3.3.

Daniel A. Post

Metairie, Louisiana

CORRECTIONS & AMPLIFICATIONS

In the August 1991 New and Improved column, we should have stated that Ibis Software is a customer of AT&T's EasyLink, a fax service. Ibis will bill you \$3 for the first page and \$2 for each additional page. Ibis Software has moved to 625 Second St., #308, San Francisco, CA 94107.

In the August 1991 First Looks review of *Harvard Graphics* 3.0, we should have stated that the price is \$595, and all current users can upgrade for \$125.

In the August 1991 Utilities column we should have thanked Tom Swan for the idea that inspired WINCOLOR.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 10 for access information). All letters become the property of *PC Magazine* and are subject to editing. ■

\$649.00 **Best 9600/V.32 Value!**



ViVa MODEM

"The ViVa 9642e connects flawlessly to all the on-line services"...*Infoworld* AUG. '91

9600 bps V.32/V.42bis External Modem

- Hayes Ultra 96 compatible
- Data Compression V.42bis/MNP5
- 38,400 bps max throughput
- V.42 & MNP 2 - 4 error correction
- Asynchronous & Synchronous
- Auto speed adjustment
- Supports two-wire dial-up & lease-line operation
- Self diagnostics
- Communications Software
- 5 YEAR WARRANTY

800-854-7600

COMPUTER PERIPHERALS INC.

667 Rancho Conejo Blvd.
Newbury Park, CA 91320

ViVa & Computer Peripherals, Inc.
and Hayes are registered trademarks

The ZEOS® '386 SX

Now 20MHz Only \$2295!



Notebook.

16 MHz Only \$1995!

"THE HOTTEST DEAL ON THE NOTEBOOK MARKET" — PC MAGAZINE



"King of the Hill... Sensational... The best price-performer... Astonishing value... The number one

contender..." The praise goes on and on. Winner of PC Magazine's Editor's Choice Award and PC World's Best Buy Award, the experts love the ZEOS Notebook. And you'll love it too. Because as PC Magazine said, the ZEOS Notebook is simply "the hottest deal on the notebook market."

INCREDIBLE DESKTOP FEATURES IN A NOTEBOOK.

Pick your power. Choose our '386SX-16MHz version or go for the incredible new ZEOS '386SX-20MHz version. Combine that with our high speed hard disk, built in 1.44MB floppy drive, VGA and more — you've got the greatest notebook going at any price!

Look closely at the details. Like our crisp 10" VGA display. The ultimate in sparkling clarity featuring advanced fluorescent back-lighting for vivid VGA graphics. And then the drives.

Two drives are better than one! First, you're getting our whisper quiet high speed, high capacity hard disk. Then we've built in an industry standard 1.44 Megabyte, 3.5 inch floppy as well. And we don't stop there.

DETAILS MAKE THE DIFFERENCE!

For instance, the battery system of your new notebook is the most advanced on the market. You can quick charge, or trickle charge, any time your system is plugged in. Or, you can use the optional charging stand if you wish.

Either way, you're sure to appreciate our light weight snap-in, snap-out battery packs. They're so light and easy to use, you can easily take an extra one with you on those really

long trips. Plus, you can get even more life out of a single charge by using our programmable power management system. Hour upon hour of Notebook computing power!

CONNECTIVITY TOOL!

Your new ZEOS notebook is a great connectivity tool! Using our optional built-in 2400 baud MNP Class 5 modem, connectivity buffs will find themselves logging on at every turn.



And speaking of connectivity, we've kept the I/O easy to use too. Because unlike many of the others, your new ZEOS notebook has the same industry standard port connectors you'll find on your larger desktop system. Serial and Parallel ports; even an external VGA connector. Completely compatible!

ZEOS 24 HOUR A DAY SUPPORT.

Don't forget your new ZEOS notebook is backed

by the best Technical and Sales support in the industry, 24 Hours a Day. We're always here to help, *any time* of the day or night. And we don't stop there either.

Your new notebook is also backed by our 30 Day Absolute Satisfaction Money Back Guarantee and One Full Year Limited Warranty. You're going to be very satisfied. We don't just say it. *We guarantee it.*

ORDER YOUR OWN ZEOS NOTEBOOK NOW!

You can order your own ZEOS Notebook *right now*. Simply pick up the phone and give us a call now at 800-423-5891. Larger hard drives, carrying cases and more are also available! At last, a full featured notebook that lets you compute anywhere. You're going to love it!

ORDER NOW TOLL FREE:

800-423-5891

NOW, YOUR COMPLETE '386SX-16 NOTEBOOK! VGA, 20MB HARD DRIVE, 1.44MB FLOPPY AND MORE. LIGHT AND LOADED! INCREDIBLE. ONLY \$1995!

20MHz ONLY \$2295!

- '386SX-16 or '386SX-20.
- 1MB DRAM, expandable to 3 or 5MB.
- 20MB High Speed HDD.
- Built in High Density 3.5" 1.44MB floppy drive.
- High resolution VGA display. Fluorescent backlit 640x480, 32 gray scales. Bright and clear!
- Removable quick charge NiCad battery. Two hour plus battery life typical, more using Programmable Power Management!
- Quick charge or trickle charge using included AC power adapter.
- Extra battery packs and external charging stand available.
- 82 key keyboard. True 101 key emulation.
- Industry standard Serial and Parallel Ports.
- VGA port for external VGA color display. Great for demos!
- Total system weight 7 lbs. with battery.
- 30 Day Absolute Satisfaction Money Back Guarantee and ZEOS Customer Satisfaction Package.
- One Full Year Limited Warranty.
- 24 Hour a Day Toll Free Technical Support, 365 Days a Year.

ORDER NOW TOLL FREE
800-423-5891

FAX Orders: 612-633-1325

Minnesota: 612-633-4591

Hearing Impaired (TDD)

Orders: 800-228-5389

Outside US and Canada:

612-633-6131

MasterCard, VISA, Discover,

Am Exp, Z-Card and COD.

Open 24 Hours a Day,

365 Days a Year!



Purchase Orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing Programs are available. All prices and specifications are subject to change without notice. Please call to confirm pricing, specifications and warranty details. The following are trademarks of their respective companies: ZEOS (ZEOS International, Ltd.), © 1991, ZEOS International, Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).

CIRCLE 488 ON READER SERVICE CARD

Discover the one guaranteed



Stars cool. Volcanos fizzle. Even suns burn out. But the IBM RISC System/6000™ family of POWERstations and POWERservers is no flash in the pan. In the year or so since we introduced it, it's only gotten hotter—offering performance ranging from 9 to 25 MFLOPS and from 33 to 72 SPECmarks. All at prices that won't even make you break into a sweat.

An operating system that sizzles. The RISC System/6000 family operates on AIX®, IBM's enhanced version of the UNIX® operating system. AIX runs across the broadest range of platforms in the industry, and not only supports all major

	Hardware Price	MFLOPS	SPECmarks™
POWERserver 550	\$62,000	25.2	72.2
SPARCserver™ 470	\$77,800	3.8	19.4
DECsystem™ 5500	\$74,700	4	21.5

industry standards and programming languages, but brings you additional enhancements like enriched file system capabilities, support for advanced systems management and much more. Best of all, AIX fans the flames of the RISC System/6000 family's POWER architecture, to give you even hotter performance.

MFLOPS are LINPACK double precision where n = 100. AIX XL FORTRAN Version 2.1 and AIX XL C Version 1.1 compilers were used for these tests. SPECmark is a geometric mean of the ten SPECmark tests. All prices current at publication. IBM and AIX are registered trademarks and RISC System/6000 is a trademark of International Business Machines Corporation. UNIX is a registered trademark of UNIX Systems Laboratories. SPARCserver is a trademark of Sun Microsystems, Inc. DECsystem is a trademark of Digital Equipment Corporation. SPECmark is a trademark of Standard Performance Evaluation Corporation. HAGAR THE HORRIBLE Character(s) © 1991 King Features Syndicate, Inc. © 1991 IBM Corp.

source of power to stay hot.

DID YOU BRING
THE MARSHMALLOWS?



An applications platform spreading like wildfire. The RISC System/6000 family already runs over 3,000 diverse applications in mechanical design, visualization, software engineering, accounting, retail store management and on and on. But we're still feeding the fire. More and more applications are being written and ported over to run on the family every day.

IBM support: an eternal flame. There's never been anything lukewarm about IBM's commitment to its customers, and there never will be. With the RISC System/6000, you get the unparalleled world-wide support of IBM: service when you need it,

24 hours a day, 365 days a year. An IBM customer engineer can even come to your site and install your machines, configure your network and integrate all your systems, whether they're made by IBM or not. It's enough to make you feel warm all over.

To find out how you can harness the power of the RISC System/6000 family, call your IBM marketing representative or Business Partner at: 1 800 IBM-6676, ext. 845. Sorry, marshmallows not included.

For the Power Seeker.



CIRCLE 514 ON READER SERVICE CARD

Our New Color Monitor Will Sharpen Your Vision.



Now you can see the most complex diagrams and color illustrations in incredible detail. Crisp and clear—even through Windows.™ Without flicker to spoil the view.

1024 x 768 Resolution Without Electronic Short Cuts.

There are basically two kinds of high-resolution Super VGA color monitors. Those that are interlaced. And those that are not.

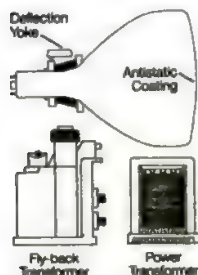
Now, a picture that's interlaced may sound like something you'd want. But interlacing is merely a way to use the same old electronics to produce higher-resolution monitors. With interlacing, the monitor's electron beams can only refresh every other line of pixels (dots) on each pass of the screen.

Understandably, this shortcut causes the screen to flicker, creating eyestrain.

"Flicker Free" monitors, made with longer-life phosphors, are an attempt to solve this problem. They slow the flicker, but produce other visual side-effects, such as "ghosting."

At Samtron, on the other hand, we designed our 14" 1024 x 768 color monitors the right way. With non-interlaced technology. With the power to light up every pixel on every pass. And we gave it a tight, 0.28mm dot pitch.

So, you get a pinpoint-sharp picture that hasn't a hint of flicker.



Samtron's new VLMF monitors use a special shielding on the deflection yoke, an antistatic CRT coating, a special type of fly-back transformer, plus a power transformer specifically designed to reduce magnetic emissions.

Our VLMF Takes The Fear Out Of Being Close.

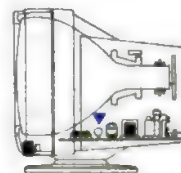
If you're concerned about electronic emissions, this high-res monitor is the one to cozy up to. Its VLMF (Very Low Magnetic Field) cuts emissions to less than 25 milligauss, measured at 20" from the screen.

That's even lower than Sweden's stringent standards call for.

Picture Perfect Technology Is More Than Meets The Eye.

Behind our high-resolution screen is a design so unique it results in a picture perfect display.

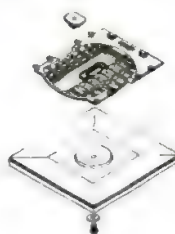
It starts with our new compact OneBOARD™ that contains all the electronics, even the power supply. Thus streamlining interior parts. Cutting the heat. Adding reliability. And extending monitor life.



It also plugs into any power supply from 90 to 260 volts. Has an automatic degaussing coil. Up-front controls. Non-glare face. And SuperGLIDE™, our one hand tilt-and-swivel system.

The automatic degaussing coil, switching-mode power supply, two-stage line filter and power supply on OneBOARD.

New SuperGLIDE Design.



Altogether, the SC-428VXL gives you everything you want in a color 1024 x 768 display. Without the things you don't want.

SAMTRON

WE'RE WORTH WATCHING

14251 E. Firestone Blvd., Suite 101, La Mirada, CA 90638.
Phone (213) 802-8425.

by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Symantec Takes Two Bold Steps to Enter Two New Markets

It was just one year ago that Symantec Corp. acquired Peter Norton Computing and more than doubled its revenues as it took a leadership role in the PC utilities business.

This summer, in the space of several weeks, Symantec made its bid to become dominant in two more major software categories.

In July, the company reached an agreement to acquire Zortech, a small company that has been a leader in 32-bit and object-oriented programming. The company's C++ compiler was reviewed in our Toolkits column (June 11, 1991).

And in August, Symantec reached an agreement to acquire DMA, makers of *pcAnywhere* and codevelopers of Novell's *NetWare Access Server*. *pcAnywhere*, a 1988 Editors' Choice, is frequently on our list of the Top 15 Sellers at Retail.

The strategy that Symantec hopes to follow is remarkably similar to the philosophy that has worked so well for Borland. Symantec plans to build a full line of software that spans virtually every category of interest to corporations, all of it built on a single core technology.

This core technology will consist of C++ class libraries. The technology is still being developed, but the acquisition of Zortech will certainly speed up the process.

Becoming a full-service supplier makes economic sense since Symantec already has a sizable corporate sales force. Even though *The Norton Utilities* and *The Norton Commander* were

popular when Symantec acquired them, sales accelerated since the acquisition, partly because large accounts would rather buy all of their software from the same supplier, if the products are right.

Symantec's first product was *Q&A* in 1985. At the time it was developed, Symantec was hoping that the product's natural language interface, based on artificial intelligence concepts, would make it a hit.

Instead, *Q&A* became a hit because it had an easy-to-use interface and showed good performance at basic database tasks. (The newest version will be reviewed as part of a roundup of flat-file databases in our December 17, 1991, issue.)

Soon after *Q&A* became established, Symantec went on a buying spree. In 1987 it acquired three small but successful software companies: Breakthrough, makers of *Time Line* project management software; Living Videotext, makers of *ThinkTank*; and Think Technologies, makers of C and Pascal compilers for the Macintosh.

In recent months, most of the company's new products have been developed for *Windows*. On *Target* is a brand new project management program designed to help scheduling at a simpler level than *Time Line*. Then there's *JustWrite*, which competes against *ProWrite Plus* from Software Publishing as a low-end alternative to *Microsoft Word for Windows* and *Lotus's Ami Pro*. And *The Norton Desktop for Windows*, which is a complete toolbox of utilities for *Win-*

dows (it will be compared with *The Norton Utilities* and *PC Tools Deluxe* in a January 1992 review).

With a core technology based on C++, it shouldn't be surprising that Symantec is planning more *Windows* products, including *Q&A for Windows*.

Chips & Technologies Readies Challenge To Intel

AMD is not the only company daring to compete with Intel's dominant line of processors.

Chips & Technologies (C&T), the company that made its name by developing an EGA-compatible video design, is introducing a family of processors that are Intel-compatible. There will be math coprocessors (the

SuperMath 387000DX and SX); 32-bit processors (the Super-386DX and SX); and the "PC on a chip," an 8086-compatible processor that integrates video, a memory controller, an I/O controller, and power management on a single chip.

This last product will be available before the others and could have the biggest initial impact.

It will enable manufacturers of laptops and palmtops to dramatically reduce the components needed in their designs. With power consumption of only 3 to 5 volts, it should help power laptops that can run for 10 to 12 hours.

And while it's based on the lowly 8086, it employs a four-

CONTINUES ON PAGE 30



SURVEY: WINDOWS' EFFECT ON RAM UPGRADES

Several issues ago (August 1991) we reported the results of a survey of *Windows* users. That survey asked callers to PC MagNet if *Windows*' healthy appetite for disk space had caused them to upgrade their systems' storage. About 40 percent said they were adding more disk storage, and nearly half of this group said that *Windows* was the primary reason.

This time, we asked PC MagNet callers about *Windows* and memory. Of the 1,017 callers who responded to the survey, 85 percent were using *Windows*, and about a quarter of those who were not using *Windows* said they planned to start within the next 12 months. While more than half of the respondents said they had added memory already, another third said they planned to add more in the next year.

A third of those who have already added memory said they added 2MB or 3MB of RAM, and another third said they added something in the range of 4MB to 8MB.

Has memory been added to your system in the past 12 months? Or will it be added?



Pipeline

CONTINUED FROM PAGE 29

stage 16-bit pipeline architecture and can run up to 14 MHz; C&T claims it will have a 2-mips performance, comparable with an 80286 processor.

C&T's line of 386-compatible processors will start with the 38600 series (SX and DX), which offers pin-for-pin compatibility with Intel's 386 and, C&T claims, a 10 percent performance gain, since the company uses a five-stage pipelined architecture.

More advanced chips will not be pin-compatible but will add system management architecture (called SuperState) that will let programmers virtualize features into the processor. Device emulation, software acceleration, and power management are the types of tasks that C&T expects designers to virtualize.

These features are at the heart of C&T's new direction: the customizable processor.

C&T says the new chips will hold up to any legal challenges since they were created in a "clean room" environment, meaning the chip designers had no knowledge of Intel's chip architecture, only its supported calls.

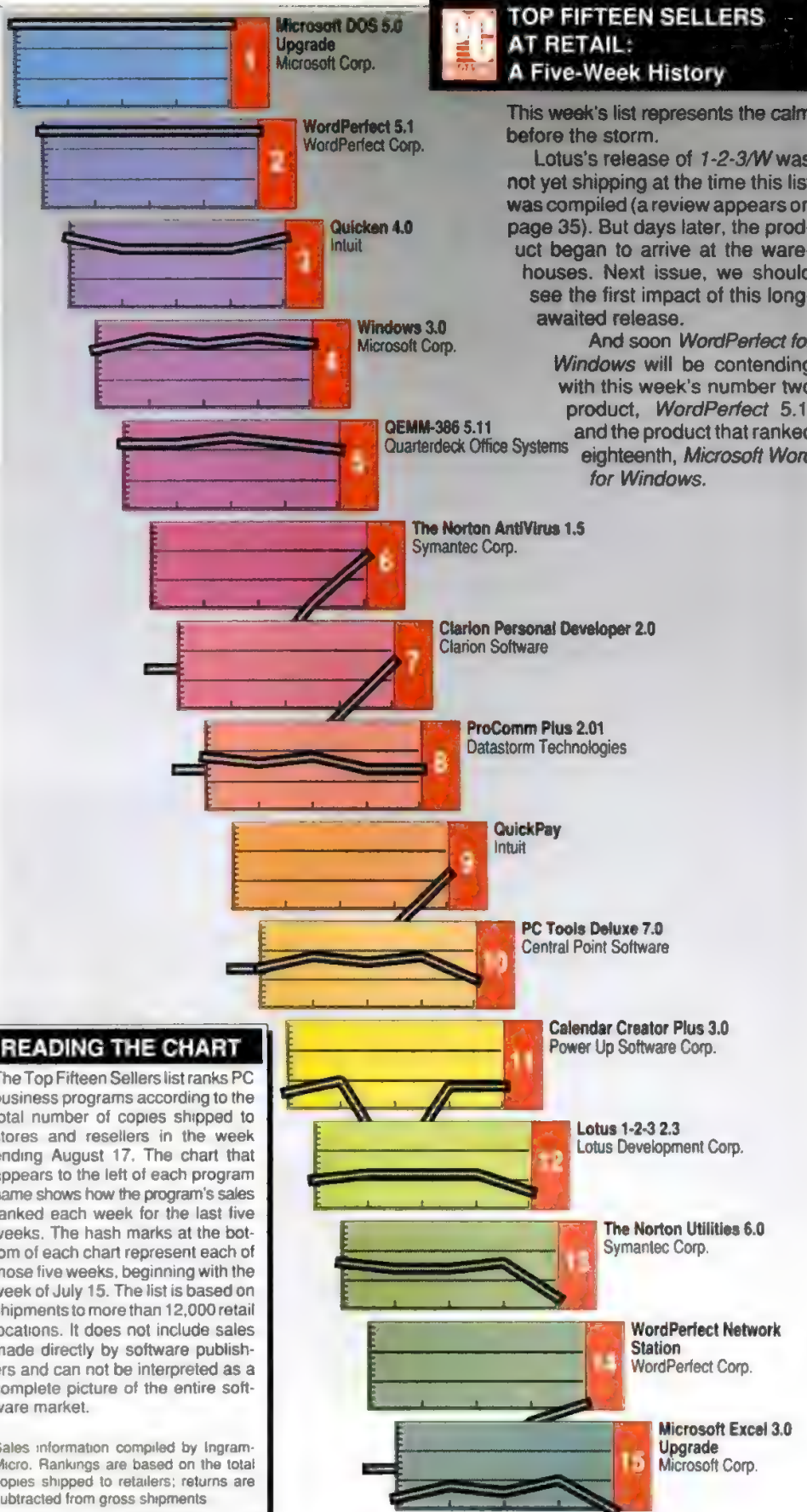
Intel Pulls 50-MHz 486 Chips off the Market

Just after Dell began shipping the first machine to use a 50-MHz 486 processor—and after a review appeared in *PC Magazine* (First Looks, September 24, 1991)—Intel pulled the processor off the market.

Intel said it was having quality-control problems in manufacturing the chip. Dell maintained that there were no problems in any of the processors it used in its PowerLine 450SE, but it took the machine off the market based on Intel's request.

AMD Sues Intel

Even though AMD's 386-compatible processor is being used by a growing number of manufacturers, the company has sued Intel for \$2 billion, claiming that Intel is pressuring some PC makers to not use the chip. ■



When you buy a new Windows™ system package from ZEOS® you really get a bundle.

Lotus 1-2-3® for Windows
Lotus Ami Pro® 2.0
Microsoft Windows 3.0
Microsoft DOS
Microsoft Mouse

ZEOS.

There's no reason to buy anything else.

800-423-5891

This offer is good for a limited time only. A ZEOS Windows system is any new ZEOS computer system packaged with Windows, 2MB DRAM or more and a mouse. Lotus, 1-2-3 and Ami Pro are trademarks of Lotus Development Corporation, Microsoft and Windows of Microsoft Corporation. All prices and specifications are subject to change without notice, call for current information. ZEOS is a publicly traded company NASDAQ/NMS Symbol: ZEOS © ZEOS International, Ltd., 530 5th Avenue NW, St. Paul, MN 55112.

CIRCLE 722 ON READER SERVICE CARD



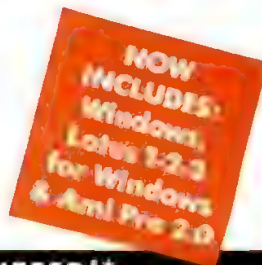
ZEOS 386SX

The Incredible ZEOS 386SX-20! 2MB 53ns RAM, 85MB Drive, VGA Color, Lotus 1-2-3 for Windows, Ami Pro 2.0 and more! **ONLY \$1995.**

It's what everyone wants. Our new 386SX using the latest high-speed memory for true 20MHz Zero Wait-State performance. Loaded with features and ready to ship to you today!

- '386SX-20 CPU, 8/20MHz.
- 2MB of Zero-Wait 53ns DRAM, expandable to a System Total of 16MB on the motherboard.
- 85MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port on the motherboard.
- 7-16, 1-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 200 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

Computers Now! SM



RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 or '486 today! We've built up an extra supply of the hottest selling computers in America—the ZEOS 386SX-20 *plus* the ultra-fast ZEOS 386DX-33 and 486-33MHz thunderbolts. Hot systems *ready now!*

Take your pick! All three of these Color VGA screamers come packing a high capacity high speed hard drive, tons of memory, two floppies *plus* all the other goodies. And they're ready to ship. *Right Now!*

Here's how it works. We have these incredible ZEOS '386 and '486 Color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 or '486 systems configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.

*OUR GUARANTEE TO YOU:

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're high performance, high quality ZEOS systems. Packing all the ZEOS value that has won PC Magazine Editor's Choice—*eight times!*

But the real winner is you! Compare price, performance, quality and features. You'll see why PC Magazine selected ZEOS '386 systems "For Overall Excellence" above all others. But don't stop there.

How about *24 Hour A Day Toll Free Technical Support*. It was ZEOS who invented 24 Hour a Day Toll Free Support (it's an idea others have since copied but haven't matched). Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty, Express Replacement Parts Policy and Customer Satisfaction Package. You'll love it all. Almost as much as your new system.

So give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: Microsoft, MS-DOS and Windows of Microsoft Corporation; Lotus, 1-2-3 & Ami Pro of Lotus Development Corporation; ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company. NASDAQ symbol: ZEOS



ZEOS 386-33 or ZEOS 486-33

**The 33MHz ZEOS '386! 128K Cache, 4MB RAM, 130MB HDD, VGA Color, Lotus 1-2-3 & Ami Pro for Windows!
ONLY \$2795.**

Power packed and ready to go! Order it UPS Red and this 33MHz Racer can be on your desk tomorrow!

- Upgradable '386-33 CPU, 8/33MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 128K SRAM Cache.
- 4MB of High Speed 53ns DRAM, expandable to a System Total of 32MB on the motherboard.
- Ultra Fast 130MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built onto the motherboard.
- 7-16 and 1-8 bit expansion slots. 80387 math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.



Optional ZEOS Vertical Case

**Loaded ZEOS '486-33MHz Screamer. 128K Cache, 4MB RAM, 130MB drive, VGA Color & Full Lotus bundle!
ONLY \$3095.**

From a family of eight *PC Magazine* Editor's Choice computer systems. Your 33MHz '486 Screamer in our 7-bay desktop case.

- Modular '486-33 CPU, 8/33MHz Dual Speed Keyboard Selectable.
- Ultra high speed Zero-Wait 128K SRAM TurboCache.
- 4MB of Zero-Wait DRAM, expandable to a whopping 32MB on the motherboard.
- 130MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppy drives.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built onto the motherboard.
- 7-16 and 1-8 bit expansion slots. 80387 math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

ZEOS. Fast Delivery, Great Systems! A Few Expert Opinions:

■ **PC Magazine, On the ZEOS 386SX, "With so much going for it, how could you go wrong?"**

■ **PC Magazine, On ZEOS '386 systems, "Out of 104 Machines... For Overall Excellence we selected ZEOS International..."**

■ **PC Magazine, On Zeos '386 Speed, "The ZEOS blows away every other computer... a smart choice."**

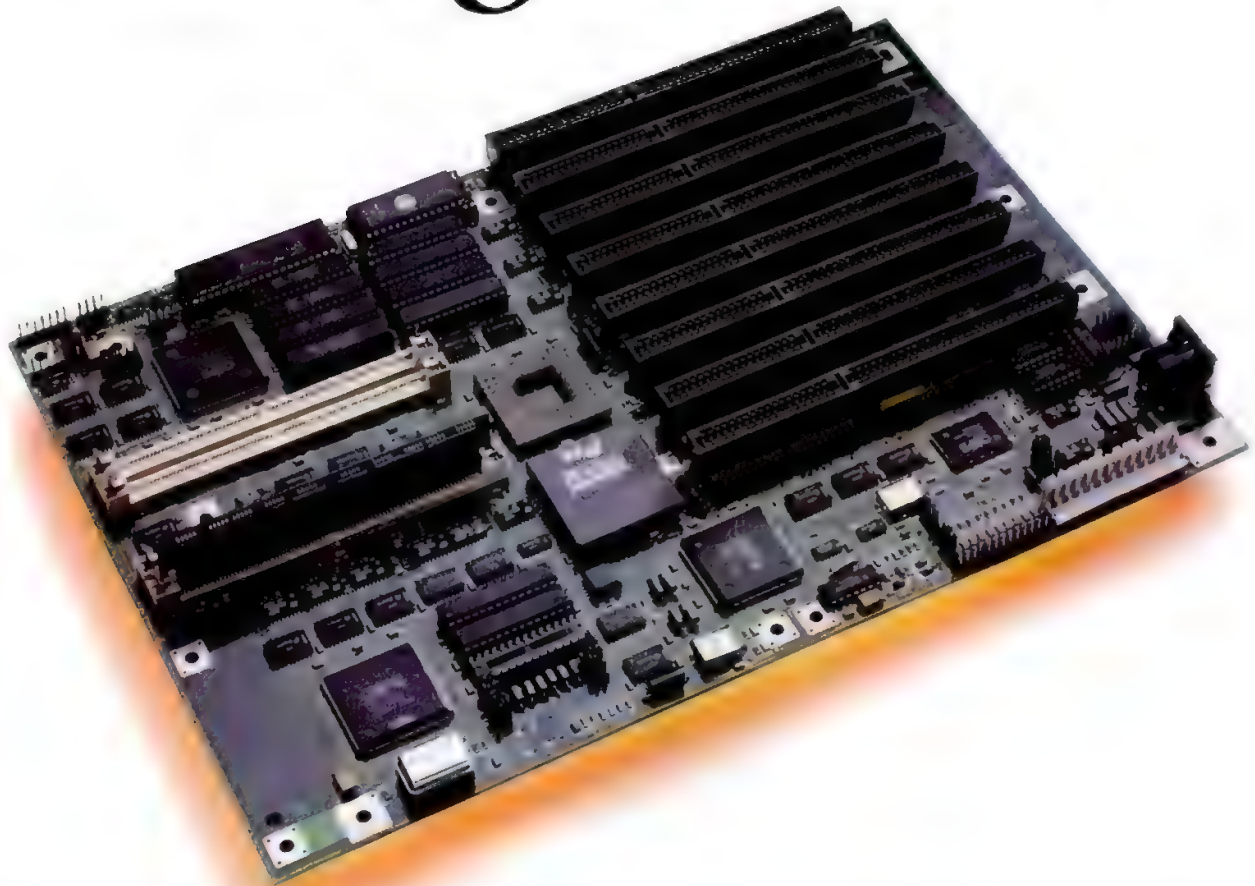
Now includes Lotus 1-2-3 for Windows and Ami Pro 2.0!

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders: 612-633-1325
Minnesota: 612-633-4591
Hearing Impaired (TDD)
Orders: 800-228-5389
Outside US and Canada:
612-633-6131
MasterCard, VISA,
Discover, Am Exp, Z-Card
and COD.
Open 24 Hours a Day,
365 Days a Year!



SmörgåsBoard!



INTRODUCING THE 386N SERIES—

STARTS FROM \$895: Feast your eyes on the new 386N MotherBoard from Hauppauge. Our 32-bit 25 and 33MHz 386DX boards boast the latest in VLSI technology. You'll find everything you need on board, including SIMM memory expandable from 1MByte to 32MBytes; static RAM cache up to 256K; serial and parallel I/O ports; floppy and IDE disk controllers and much more. Choose your own VGA to complete "the Mother of all MotherBoards!"



FLEXIBILITY: The "N" in 386N stands for *New* and *Next* generation. Developed with the new super I/O chipset, our boards are designed to exploit the next generation of SIMM modules to bring on-board memory expansion to *128MBytes!* The N series also features Intelligent BIOS™, making it easy for you to install a variety of new I/O cards. What's more, Intelligent BIOS supports future generation IDE disk drives. Simply add components as you see fit!

PERFORMANCE: Thanks to high-speed static RAM cache—from 0 to 256K—you can automatically make CAD, database and networking programs really *cook*. The more cache, the faster your programs go. (Regarding compatibility, if you assume it's excellent, you're right.)

RELIABILITY: Built to Hauppauge's exacting quality standards, the 386N boards are available in AT and XT sizes to work with your Tower, Minitower, Desktop or Workstation chassis. All boards are made in the USA and backed by a 1-year warranty.

If you're power hungry, we've got dinner. Our new 386N series combines performance, flexibility and low cost to help you configure the most successful systems on the market. For more on our boards, file servers and workstations, call: **1-800-443-6284**.

Hauppauge Computer Works, Inc.
91 Cabot Court
Hauppauge, New York 11788

In New York: **516-434-1600** In Europe: **(49) 2161-17063**

Hauppauge!

First Looks

Hands-on Reviews of the Latest Products

Lotus 1-2-3 for Windows: Long on DOS Compatibility, Short on Innovation

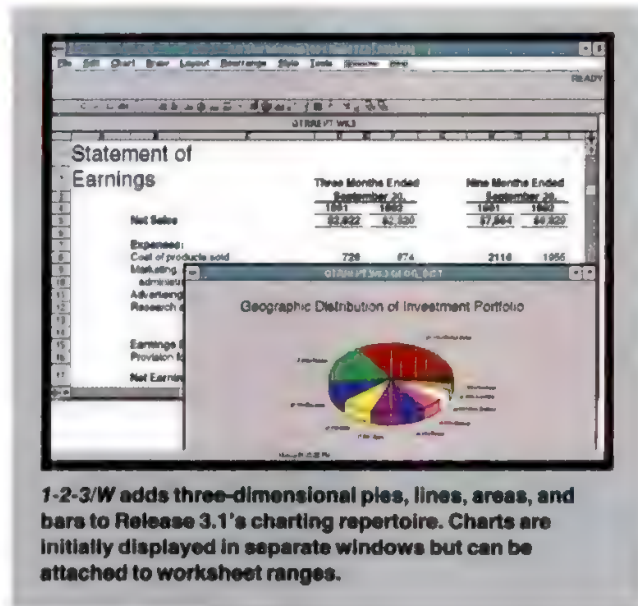
HANDS ON
by Craig Stinson

There's good news and bad news for the millions of Lotus 1-2-3 users contemplating a move to Windows. The good news is that you can bring all your character-mode applications and keystroke habits with you to the graphical environment. The bad news is that Lotus hasn't given you many reasons to do so.

The \$595 Lotus 1-2-3 for Windows is a faithful port of the DOS-based Release 3.1+, the latest version of Lotus's three-dimensional character-mode spreadsheet. 1-2-3/W incorporates a Windows-style interface, with drop-down menus, dialog boxes, a customizable set of command-shortcut icons, and the ability to size cells and windows via a mouse. But it also replicates Release 3.1's user interface.

Press a slash or colon and you get the familiar 1-2-3 or WYSIWYG menu in a movable "classic menu" window. You can continue to operate 1-2-3 with the classic keystrokes while you learn the Windows menus. Or you can stick with the classics forever. Because there's little innovation in 1-2-3/W; almost all of the program's functionality is available from the classic window.

Like Release 3.1+ and 1-2-3/G, Lotus 1-2-3/W includes the Solver—a nonlinear optimizer that takes the trial and error out of resource-allocation problems—and DataLens drivers for dBASE IV, SQL Server, and Paradox. Release 3.1's au-



ditor and file-viewer add-ins are not included, but an add-in tool kit is available.

With the keystroke core of 3.1 unchanged in 1-2-3/W, most macros written for the DOS en-

vironment run flawlessly in Windows. A few classic menu commands, such as /System and /Worksheet Status, are inoperative in 1-2-3/W. Macros that execute such commands will not

Compaq Adopts Upgradable Design, Aggressive Stance

PREVIEW
by Matthew J. Rose

Over the years Compaq has achieved innovator status more than once. It introduced the 386 PC, succeeded in pulling memory off the I/O bus to run at system speed through its FLEX architecture, helped spearhead EISA as an alternative 32-bit architecture to IBM's Micro Channel, and brought drive-ar-

ray technology down to the PC workgroup level.

This time, Compaq's not leading the charge with its newest line of upgradable desktop PCs. ALR, AST, IBM, and Zenith have already pioneered this territory.

The Deskpro/M line, which runs the gamut from a 25-MHz 386 to 33-MHz 486DX systems, is distinctively Compaq's, with the engineering,

OCTOBER 29
REVIEW INDEX

Lexmark 10L: HP IIISI gets a run for its money.....42

Toshiba T2200SX: 5.5 pounds of top-notch features.....44

Beyond Mail: E-mail that plays by your rules.....48

QEMM 6.0: Newfound space in RAM.....52

behave the same way in 1-2-3/W (nor will macros that depend on the fixed dimensions of the DOS worksheet window), but they won't generate runtime errors. 1-2-3/W also uses the Release 3.x .WK3 and .FM3 file formats, so a 1-2-3/W worksheet can be passed back to a Release 3.x user, complete with formatting information.

Display and I/O issues aside, the performance of 1-2-3/W's calculation engine is comparable with that of Release 3.1, which is much slower than Release 2.2, Release 2.3, and Microsoft Excel. With Lotus's

CONTINUES ON PAGE 36

rugged construction, and fit and finish that you would come to expect from the Houston computer manufacturer.

What it lacks is the innovation we have come to expect from Compaq; there are no new technologies in this offering.

Perhaps the biggest surprise of the whole announcement is the price tag. Compaq's Deskpro 386/25M with a 120MB drive lists for \$3,999. At the top of the line, a comparably equipped 486/33M costs \$5,699. Both prices compete

CONTINUES ON PAGE 37

First Looks

Lotus 1-2-3 For Windows

CONTINUED FROM PAGE 35

stated minimum memory configuration of 2MB, 1-2-3/W spends an obnoxious amount of time thrashing the hard disk.

On top of the Release 3.1 core, Lotus has added SmartIcons, support for the Windows Clipboard and dynamic data exchange, a few new macro keywords for DDE, window sizing and positioning, and committing and rolling back external database transactions. The product supports the Windows multiple document interface (MDI), uses the standard Windows help engine, and comes bundled with Adobe Type Manager, Version 1.15. Support for object linking and embedding (OLE) has been promised for the near future.

The most visible and marketable of these new items is the SmartIcon palette, which is likely to be a standard component of all major Lotus Windows

applications from now on. The palette provides mouse shortcuts for whatever commands or macros you use the most.

Lotus gives you two default icon sets, one for worksheets and one for graphs. If you're not sure what a particular icon does, you can click on it with the right mouse button and read a line of explanatory text. If you don't like the default position of the palette, you can move it. If you're not happy with the contents of the icon, you can modify it to suit your preferences.

SmartIcons are a fine idea and an effective use of the graphical environment. Elsewhere, however, 1-2-3/W's use of Windows is minimal, unconventional, sluggish on-screen, and buggy.

Release 3.x allows you to look at three successive worksheet pages in fixed "perspective view" windows. It's not a very convenient way to work with multiple sheets, but it's serviceable for overview purposes and acceptable in a character-mode application. Unfortunately, Lotus merely replicated this feature in the

Windows environment, where the fixed-position, fixed-size windows seem rather ludicrous.

Most Windows applications use dialog boxes to report current command settings as well as to accept new choices. Even Release 2.3 does this with its "setting sheets." Many of the important dialogs in 1-2-3/W, however, provide no such feedback. File Save As lists no existing files by default, for example, and Style Fonts tells you nothing about the state of the current cell (the font list comes up with no selected element, and all the styling check boxes are gray—both of which mean something quite different in most other Windows programs).

Choosing File Save with a brand-new file, meanwhile, doesn't get you the File Save As dialog, as it does in nearly all other Windows apps. Instead it saves your work under the current default name (FILE-0001.WK3, for example)—which means these default-named files will clutter many users' disks.

Cutting and pasting in most Windows programs relocates an object without changing it. Not so in 1-2-3/W, where Edit Cut and Edit Paste move a formula and update its cell references. The Edit menu also offers a Move Cells command, which transfers cells in the conventional manner—without reference update. You can only wonder how many users will scramble their worksheets before discovering the difference.

Most MDI-supporting programs issue individual save prompts for each open document at quitting time. 1-2-3/W not only fails to report which of your open files haven't been saved, it also accepts a single Save/Abandon decision for the whole lot.

The ability to select a range of cells with the mouse is handy. But 1-2-3/W insists on building the selection in the formula bar while you drag, producing an irksome screen-response delay for no apparent purpose. Pointing to a cell reference with the keyboard gives

BENCHMARK TESTS: LOTUS 1-2-3 FOR WINDOWS

On arithmetic recalculations (addition, subtraction, multiplication, and division), Lotus 1-2-3 for Windows takes 2.5 times as long as Microsoft Excel 3.0 (its chief Windows spreadsheet competitor), and about 37 percent longer than its predecessors, Release 2.2 and 2.3. On the Table Recalc test, the difference between the latest generation of Lotus 1-2-3 spreadsheets and the Release 2 vintage is about one power of 10.

■ **The Mathematical Worksheet Recalculation** test measures the time a program takes to calculate a worksheet containing 1,456 mathematical functions (square root, addition, subtraction, multiplication, division, and @SUM).

■ **The Table Recalc** test measures the time it takes to cross-tabulate 200 database records in a one-variable sensitivity table, using the @DSUM function.

■ **The Load from Disk** test measures the time it takes to load the Mathematical Worksheet Recalculation file from disk in the program's native file format.

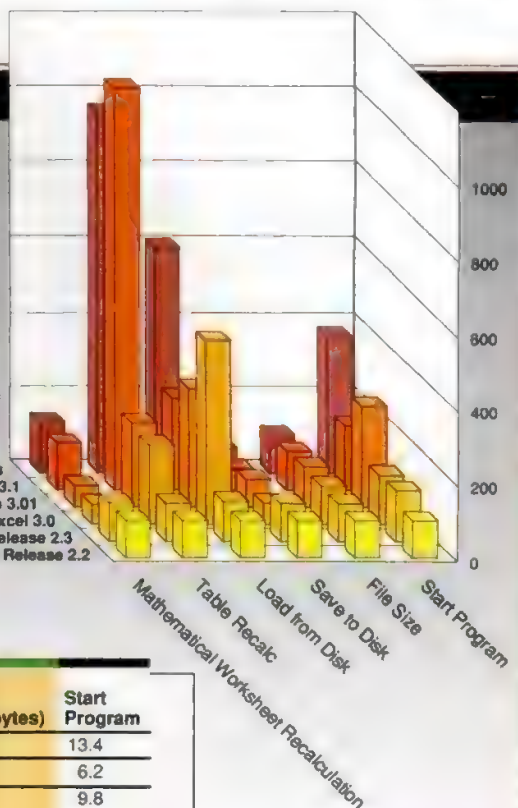
■ **The Save to Disk** test measures the time it takes to write the same test file to disk in the program's native file format.

■ **File Size** reports the size of the Mathematical Worksheet Recalculation file written to disk in each program's native file format. In most cases, each package tokenizes the saved spreadsheet to conserve space.

■ **Start Program** reports the time it takes the program to load itself into memory from the hard disk, starting either at the DOS prompt or from Windows' Program Manager.

We performed these tests on an EPS Technologies 33-MHz 486 with 8MB of RAM and a 200MB IDE hard disk running Microsoft Windows 3.0 (in its 386 Enhanced mode) and DOS 4.01.

Lotus 1-2-3 for Windows
Lotus 1-2-3 Release 3.1
Quattro Pro 3.01
Microsoft Excel 3.0
Lotus 1-2-3 Release 2.3
Lotus 1-2-3 Release 2.2



Performance Scores (All times given in seconds)

	Mathematical Worksheet Recalculation	Table Recalc	Load from Disk	Save to Disk	File Size (kilobytes)	Start Program
Lotus 1-2-3 for Windows	8.4	183.2	4.5	2.2	82.8	13.4
Lotus 1-2-3 Release 3.1	7.6	204.2	1.8	1.9	82.8	6.2
Quattro Pro 3.01 (with WYSIWYG)	3.6	42.7	2.4	2.5	86.6	9.8
Microsoft Excel 3.0	3.3	39.7	3.7	1.9	83.3	4.8
Lotus 1-2-3 Release 2.3	6.2	19.0	0.8	3.3	80.6	4.9
Lotus 1-2-3 Release 2.2	6.1	19.0	0.7	3.3	80.6	3.6

you a single-cell reference; the same action with the mouse inserts a single-cell range into a formula—again for no apparent purpose.

Bugs abound. Moves, copies, and gotos sometimes leave the screen in an invalid state, forcing you to do a PgDn-PgUp to see the effect of your action. During lengthy file saves and graph updates, 1-2-3/W sometimes fails to display the hourglass, leaving you with a normal-looking, but inert, mouse pointer. The CMD indicator sometimes fails to appear during execution of \0 macros. 1-2-3/W's translation of Excel 2.1 worksheets is incomplete and sometimes inaccurate; there is no support for Excel 3.0 worksheets. Also, a Paste Link from an Excel formula cell generates useless references to cells on the client 1-2-3 worksheet.

Stressing compatibility with its DOS products above all other concerns was an obvious and correct design goal for Lotus, and the company has met this goal completely. For the majority of 2.x and 3.x users, that may be enough. But Lotus has lost a lot of its market share to Microsoft and Borland in the last 12 months, and this timid entry into the Windows market isn't likely to stem the tide. ■

Compaq

CONTINUED FROM PAGE 35

aggressively with the major upgradeable systems (See "Compaq Takes Aim at Four Upgradeable Lines").

Compaq achieves its "upgrade-ability" through a modular approach that allows users to easily change the three primary components of their systems: CPU, system memory, and video. Each member of the Deskpro/M family consists of the same basic shell: A 5.9- by 14.8- by 16.8-inch case holds a seven-slot passive backplane with the EISA chip set. The first two slots are proprietary, holding the CPU and memory cards. The five remaining slots are 8-/16-/32-bit EISA architecture, with the third slot holding the system's video adapter.

The Deskpro/M is intended for business desktops, and certain design decisions have been made accordingly. In the CPU module, Compaq offers four CPU choices residing on interchangeable daughtercards, including a 25-MHz 386, a 33-MHz 486, and in between, two new Intel processors, the 16- and 25-MHz 486SXs. The upgrade process takes approximately 15 minutes. It involves



The Compaq Deskpro/M family ranges from a 25-MHz 386 to a 33-MHz 486.

PHOTOGRAPHY: DOUGLAS WHITE

opening the case, swapping CPU boards, and running an automatic configuration program off a floppy disk.

Since these machines will be used primarily as personal business machines, Compaq has not included an external cache on any of the 486 models. They rely on the 486's internal 8K cache. Compaq said that the internal cache was sufficient in most standard business applications, like word processing and spreadsheets, and that claim proved true on our benchmark test. The Deskpro 386/25M features a 16K, four-way set associative cache, which pushed the

performance of that system past Compaq's Deskpro 386/25e. Both the Deskpro 486s/16M and the 486s/25M can be upgraded with Intel's 487 chip via a performance upgrade socket.

The second module in the Deskpro/M family contains system memory. Memory is standard across the Deskpro/M line, in the form of a proprietary card that holds up to 64MB of SIMMs.

The third module contains system video. Responding to its customers, Compaq has improved its video to operate at Super VGA 800 by 600 pixels

CONTINUES ON PAGE 38



FACT FILE

Lotus 1-2-3 for Windows, Release 1.0

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-343-5411, 617-577-8500.

List Price: \$595; upgrade for licensed users, \$150; for those who purchased 1-2-3 after March 1, 1991, \$49.

Requires: 2MB RAM, Windows 3.0.

In Short: This is an unambitious, rough-edged Windows port of Lotus 1-2-3, Release 3.1+. Calculation performance is comparable with that of Release 3.x; screen performance is slower. Compatibility with 1-2-3, Releases 2.x and 3.x is as complete as possible, but the use of the Windows interface is unconventional and buggy.

CIRCLE 700 ON READER SERVICE CARD



BENCHMARK TESTS: COMPAQ DESKPRO/M FAMILY

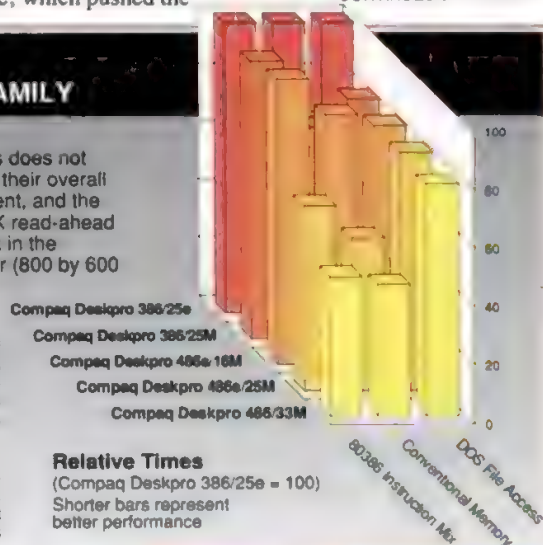
The Compaq Deskpro/M family of modular PCs does not suffer any performance degradation, even with their overall flexibility. The processor performance is excellent, and the 120MB IDE hard disk takes advantage of a 64K read-ahead buffer to outperform the 300MB ESDI hard disk in the Deskpro 386/25e. Compaq's new video adapter (800 by 600 pixels with 16 colors) was not available at testing time.

■ The Instruction Mix benchmark test times a series of tasks specific to the processor. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at relatively slow access speeds.

The DOS File Access score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test measures disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

N/A—Not applicable



Performance Times (Times given in seconds)

	80486 Instruction Mix	80386 Instruction Mix	Conventional Memory	DOS File Access
Compaq Deskpro 386/25e	N/A	2.26	0.42	59.89
Compaq Deskpro 386/25M	N/A	2.16	0.31	49.42
Compaq Deskpro 486s/16M	2.26	2.22	0.36	49.16
Compaq Deskpro 486s/25M	1.45	1.43	0.22	48.82
Compaq Deskpro 486/33M	1.10	1.08	0.19	47.56

First Looks

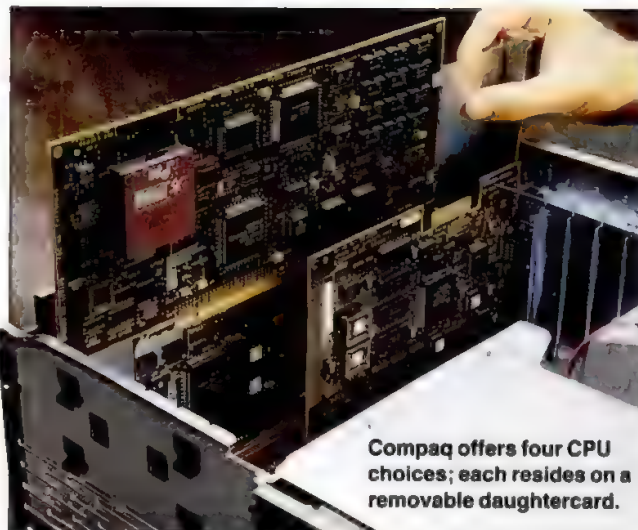
Compaq

CONTINUED FROM PAGE 37

with 16-color resolution, although this feature was not ready when *PC Magazine* evaluated the Deskpro/M family. The video circuitry also supports 256-color VGA with a graphics accelerator, and the ISA board has a pass-through connector to use with higher-resolution boards.

Currently, Compaq offers monitors that support only VGA, so Super VGA users will be forced to buy a third-party screen that supports the higher resolution. Also, Compaq's move to higher resolution is a halting first step, as most systems today now support 256 colors at 800-by-600 or even 1,024-by-768 resolutions.

Compaq's modular design will make it easier for the company to respond to change, though. Customers are no longer locked into a video system



Compaq offers four CPU choices; each resides on a removable daughtercard.

PHOTOGRAPHY: DOUGLAS WHITE

COMPAQ TAKES AIM AT FOUR UPGRADABLE LINES

by Matthew J. Ross

With the introduction of its Deskpro/M line, Compaq has targeted AST Research, Dell Computer Corp., Advanced Logic Research, and IBM as the companies it needs to beat.

A look at the competition reveals some differences of philosophy. We compared machines from each of these vendors; each machine had 4MB of RAM, a VGA monitor, and DOS.

AST has remained solidly ISA-based, with lower prices than the others. Dell features two upgradable lines. Its PowerLine series of towers and desktops are EISA-based. Our chart includes statistics on the ISA-based Dell System 333P and 433P, models that

are comparable with the AST Premium II when you adjust for different-size hard disks.

ALR has embraced all three of the current expansion architectures—ISA, EISA, and Micro Channel—and features an upgradable scheme for all three. We've taken its BusinessVEISA system for comparison, since it's the most similar to the Deskpro/M family.

IBM, solidly MCA, has also adopted an upgradable scheme with its PS/2 Models 90 and 95. Big Blue's processor choices start with the 20-MHz 486SX and extend through 25-, 33-, and 50-MHz 486DX choices. It does not offer a 386 version in its upgradable line. ■

that has been incorporated directly onto the motherboard.

Storage possibilities are more than adequate for a personal desktop system. The Deskpro/M features four drive bays. The top bay is one-third height and holds a 3.5-inch high-density floppy disk drive. Two half-height bays also accept removable media and are suitable for a second floppy, tape, or CD-ROM drive. The hard disk drive is mounted sideways, alongside the three drive bays. The tested systems featured a 120MB IDE disk and an ample 240-watt power supply. The hard disk performed well, and its integrated electronics left the four remaining EISA expansion slots open.

A modular I/O board plugs directly into the motherboard—again sparing an expansion slot. The I/O board features two serial ports, a parallel port, and a PS/2 mouse port. Compaq did not reveal any specific plans, but there is suitable real estate on this board to support a built-in modem, and connectivity options are possible future considerations as well.

Overall, the Deskpro/M line will satisfy any corporate buyer looking to standardize on a single product line. The Deskpro/M family's shared architecture will ease the support burden of corporate MIS departments. Compaq's promise to challenge Dell, ALR, and AST with aggressive pricing is good news for everyone looking to buy PCs. Compaq's quality con-

struction combined with readily available upgrade potential make the Deskpro/M line a good hedge against obsolescence, especially when you consider Compaq's ACE plans for developing a RISC-based computer.

A Compaq engineer told me that there was nothing about the design of the Deskpro/M that would preclude a possible RISC plug-in CPU board in the future. Even if Compaq does not take that course, upgradable systems seem the way to go right now. ■



FACT FILE

Compaq Deskpro/M Family

Compaq Computer Corp., 20555 State Hwy. 249, Houston, TX 77070; 800-231-0900, 713-370-0670.

List Price: Deskpro 386/25M with 4MB RAM, 1.44MB floppy disk drive, 120MB hard disk, \$3,999; Deskpro 486s/16M, \$4,099; Deskpro 486s/25M, \$4,599; Deskpro 486/33M, \$5,699. VGA monitor, \$699; DOS 5.0, \$99.

In Short: Compaq's Deskpro/M family of modular, upgradable desktop PCs offer solid performance and a hedge against obsolescence. This design is well suited for companies looking to standardize on one manufacturer, minimize maintenance costs, and extend the useful life of its PCs. Compaq's modest video resolution improvement is a step in the right direction, but the company could do better.

CIRCLE 718 ON READER SERVICE CARD

	80386 Instruction Mix test score	Price
AST Premium II (with 210MB IDE hard disk)		
386/33	1.63	\$4,615
486SX/20	1.78	\$4,395
486/33	1.13	\$6,315
Dell System 333P or 433P (with 103MB IDE hard disk)		
ISA 386/33	1.65	\$3,917
486/33	1.08	\$5,616
ALR BusinessVEISA (with 210MB ESDI hard disk)		
386/33	1.65	\$6,142
486SX/20	1.83	\$6,195
486/33	1.07	\$8,142
IBM PS/2 Model 90 (with 80MB SCSI hard disk)		
MCA 486SX/20	1.81	\$9,445
486/25	1.46	\$12,495
486/33 *	1.09	\$16,345

* With 8MB RAM and a 320MB SCSI hard disk.

Ventura announces the most colorful news in PC publishing history.

New Ventura color extensions: process color from the desktop to film.

Now get the impact and excitement of color with a single-vendor solution. Ventura brings you the complete

spectrum of color prepress software. To scan, retouch, color correct, and color separate—all using the easy and intuitive Windows interface.

Quality scanning inside Ventura.

Ventura Scan™ Scan black and white, grayscale or full-color images directly into Ventura Publisher® 4.0 for Windows.

Color correct before you scan. Get professional quality using a range of popular reflective, slide or transparency scanners.

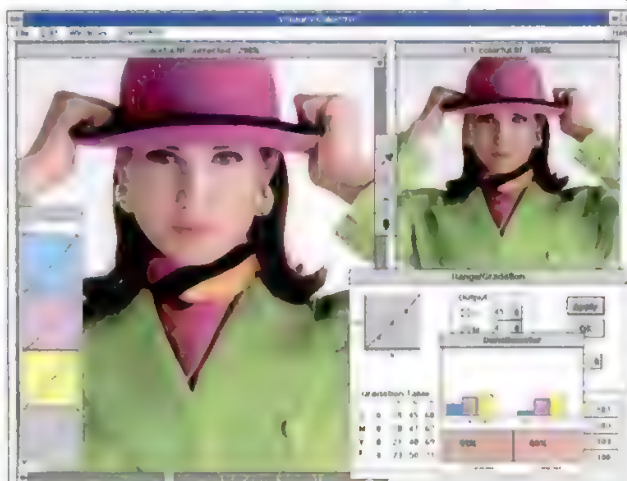
Full-page desktop separations.

Ventura Separator™ Create professional color separations of Ventura Publisher documents with text, graphics, and continuous tone color images in place, ready to print. For quality color

without the complexity or cost of traditional separation processes.

Color correct and separate images professionally.

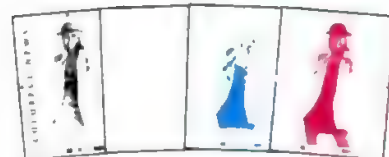
Ventura ColorPro™ High end, state-of-the-art color image processing with



the ease of Windows. Its precise, full-featured image color-correction and separation controls are designed for the demanding professional who requires trade-quality results. With PC speed, flexibility and economy.

Enhance your image.

Ventura PhotoTouch™ Professional retouching for grayscale or color. With



real-time color correction, image-editing, and masking for images of any size or resolution. Plus special effects and creative tools to alter and enhance your image until it's picture perfect.

More color for more software.

Both Ventura ColorPro and Ventura PhotoTouch are compatible with software that supports EPS, DCS or TIFF files, including DTP, paint, draw and

word processing programs.

To put the power of color into your publications, put Ventura color extensions on your PC. Call today or see your dealer for more information.

(800) 822-8221

Ventura Software Inc.
A Xerox Company



The New Ventura Color Extensions.



Beats Pagemaki

Introducing Ventura Publisher 4.0 for Windows.

For all-around publishing—not just pagemaking—Ventura Publisher* is your best choice. To quote the *PC World Face Off* report:

"PageMaker is still the better choice for graphic artists, but Ventura is better for everyone else."

PC World, June, 1991

Ventura Publisher 3.0 also clearly won the March, 1991 *PC Week Shootout*. And that was before either publication saw Ventura Publisher 4.0 for Windows.

Quality with a money-back guarantee.

We're so sure Ventura Publisher 4.0 will win you over, we're offering you a no-risk free trial. Use Ventura Publisher 4.0 up to 60 days. If you're not satisfied, your purchase price will be fully refunded.*

New features & ease-of-use.

We've added so many new features, Ventura Publisher 4.0 may now be the better choice—for anyone. A few examples:

- Search and replace for text,

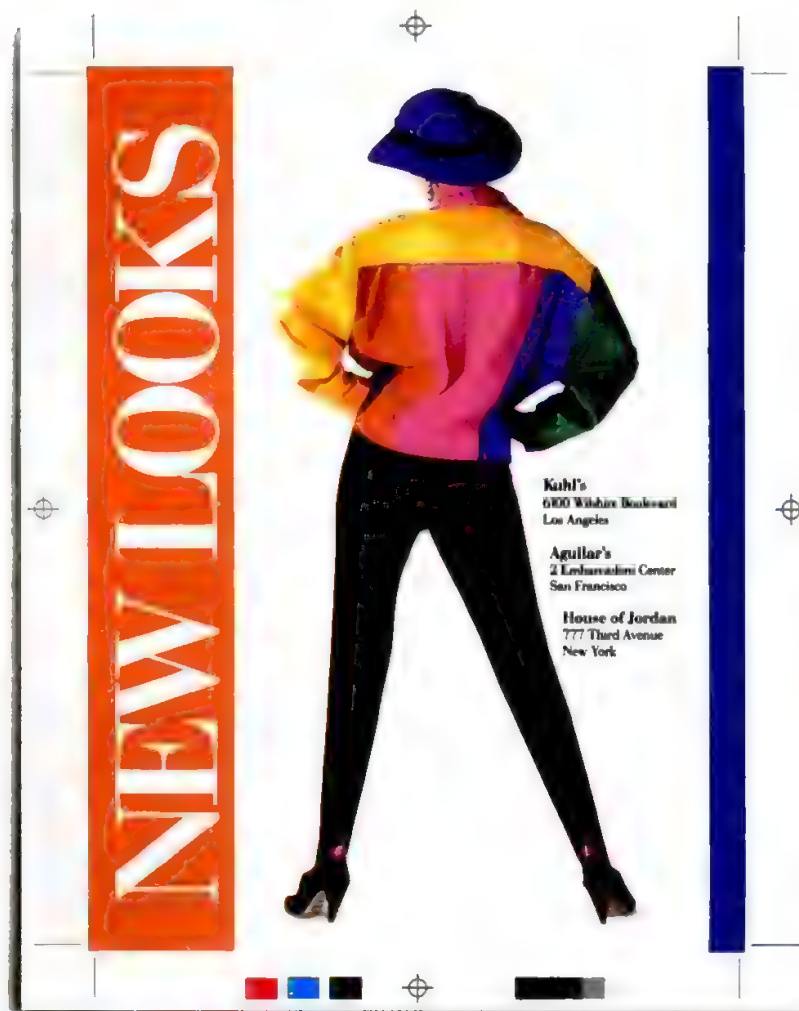
attributes, tags.

- Spell check and expanded multi-lingual hyphenation.
- Undo/redo.

- Over 50 new style sheets.

- 24-bit color support.

Plus Adobe Type Manager free with purchase.



Kuhl's
6800 Wilshire Boulevard
Los Angeles

Aguilar's
2 Embarcadero Center
San Francisco

House of Jordan
777 Third Avenue
New York



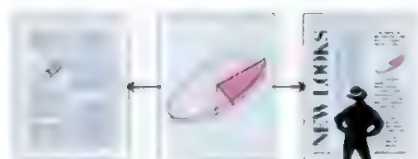
ng. Guaranteed.

Of course, Ventura Publisher has always beaten pagemaking for *real* publishing. The pasteboard approach may be OK for page design. But when you're designing a publication, you need Ventura Publisher's automation. Our unique style sheets let you format whole documents of any length without repeating steps manually. And for tasks like footnoting, table creation, table of contents, and cross referencing, Ventura Publisher does the job for you. Quickly and easily.



24-bit process color and PANTONE support for the PC.

Now you can add the impact and excitement of color to all your communications with a single-vendor solution. Ventura Publisher 4.0 plus new Ventura color extensions let you create professional quality fully-separated pages on the desktop. Scan, retouch, color correct, and color separate—all with the intuitive ease of the Windows interface. And all with Ventura.



OLE! For faster, easier communications.

Ventura Publisher 4.0 is one of the first programs with Object Linking and Embedding (OLE). OLE helps you keep Ventura documents current automatically as source files change. Just double click on the data or graphic in one document and OLE calls up the original application. Edit the original file and it's updated automatically in all linked documents.

\$129 upgrade offer—call today!

Registered users of any previous Ventura Publisher DOS/GEM or

Windows Edition can now buy our new Windows 4.0 version for just \$129. Call the number below to order now.

Ventura announces the last PageMaker upgrade you'll ever need: \$195.

PageMaker owners can now buy Ventura Publisher 4.0 for just \$195. An unbeatable deal on the DTP

program that beats pagemaking. Act now—limited-time offer! Call for full details.

(800)822-8221



Ventura Software Inc.
A Xerox Company



The New Ventura Publisher 4.0 for Windows.

First Looks

10 ppm and Affordable: Lexmark 10L Printer Fits the Bill for Medium-Sized Networks



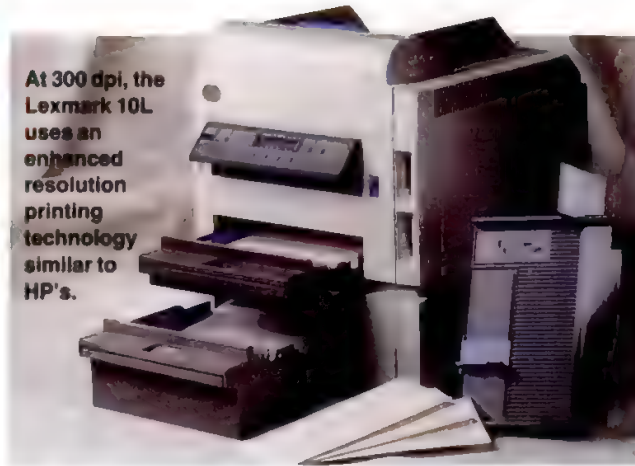
Lexmark, the newly created company responsible for designing and constructing printers for IBM, has taken IBM's old LaserPrinter Model 4019 platform and revamped it into four new 4029 series printers. The top-of-the-line 10-page-per-minute network printer in the group is the 4029-040—the Laser Printer 10L for short. At \$2,995, the printer is considerably slower than the current leader—the \$5,495, 17-ppm HP LaserJet IIISi—but sells for considerably less.

At the heart of the 10L is a proprietary IBM laser engine that uses technology licensed from Canon. According to Lexmark, the 10L, unlike the typical laser printer, has all of its engine functions built into its controller card, not into the engine itself. This design gives Lexmark the flexibility of upgrading any portion of the printer's operation without changing the basic engine.

The controller card is powered by a Motorola 68020 processor running at 16.7 MHz; workspace for the processor is provided by the 1MB of RAM that comes standard with the 10L. Two SIMM-like slots on the card let you expand the memory up to 9MB using 1MB or 4MB memory modules.

PC Magazine Labs printer benchmark tests have made mincemeat of many printers that claimed fast processors and high page-per-minute counts, but there are exceptions to every rule. With both its built-in PCL 4 and PPDS (IBM's Personal Printer Data Stream for the Proprinter and QuietWriter) emulations, the 10L posted impressive 9.0- and 8.8-ppm times under the standard (text) speed test. Graphics tests were completed at the rate of 2.6 and 3.1 graphics pages per minute under PCL 4 and PPDS, respectively.

At 300 dpi, the Lexmark 10L uses an enhanced resolution printing technology similar to HP's.



Since the PPDS is a compatibility convenience, it emulates only the 9-pin version of the Proprinter, which accounts for the speedy results. A conversion from the 360-by-360 resolution of a 24-pin Proprinter to the 300-dpi resolution of the 10L was too complex for the printer to implement.

HPGL and IBM-GL plotter emulations are included as well, and two personality slots on the controller card let you add more. If you decide to fill one of them with IBM's \$499 PostScript Level 1 board (a \$199 PCL 5 board is the other option), the 16.7-MHz 68020 will come in handy for processing graphics and font outlines. The 10L clocked 1.3 gppm in PostScript and duplicated its 9.0-ppm text speed using the default Courier PostScript font.

The PostScript emulation card provides only the basic 17 Adobe fonts. An additional 22 fonts can be added with a \$399 font cartridge. You'll also need at least 2MB of RAM to run PostScript, which means a \$199 1MB memory upgrade. That sounds like a lot of money to spend just for PostScript, but it also lets you gain 600-dpi printing. But the 600-dpi capability will cost you even more since you'll need at least 5MB of memory. (A 4MB memory module is a \$799 option).

To print at 600 dpi, the controller modulates the laser to produce a smaller dot size and lay down toner in a 600-dpi pattern. The process does slow the printer speed to about 8 ppm to help the laser's accuracy.

Those who remain at 300 dpi will also see some enhanced printing in the form of IBM's Print Quality Enhancement Technology (PQET), which is similar to Hewlett-Packard's Resolution Enhancement printing. PQET provides anti-aliasing for the scalable font technology and does an excellent job in eliminating the jaggies from large and very small size type as well as smoothing the grayscale transition areas in graphics.

You don't need PostScript to gain fonts. The standard 10L package includes 12 bitmapped fonts available under PCL 4 and 10 bitmapped fonts in PPDS. There are also 16 scalable Adobe Type 1 fonts included in PPDS and IBM includes a floppy disk with 17 scalable screen fonts. If that's not enough, you'll find two front-mounted font cartridge slots for any of IBM's credit-card-sized font cartridges.

The 10L is well appointed for any medium-sized network. Parallel and serial ports let you hook the 10L up to any server or you can add the optional IBM



FACT FILE

Laser Printer 10L (Model 4029-040)

Lexmark International Inc., 740 New Circle Rd., Lexington, KY 40511; 606-232-2000.

List Price: \$2,995.

In Short: The Laser Printer 10L's basic configuration offers network features and enhanced resolution for the price of a 300-dot-per-inch desktop printer.

CIRCLE 706 ON READER SERVICE CARD

Ethernet or Token-Ring adapter (\$845) and make it a standalone device. Unfortunately, Novell is not yet supported, but should be in the very near future.

The 10L's standard features include both 500- and 250-sheet paper feed trays (linkable for a 750-sheet total), and a 250-sheet output bin. The output bin is equipped with a paper jogger and a tray-full sensor that shuts the printer down rather than let pages jam up or drop to the floor.

The 10L also comes with a high-yield toner cartridge that Lexmark claims will last for 15,000 characters, and the initial consumables come preinstalled. The printer engine is rated for 20,000 copies per month and, best of all, there's no specified life span for the printer. Anything that might break or wear out can be replaced.

The 10L has a standard one-year warranty on parts and labor. An optional \$330 plan gives you on-site service during the warranty period. Lexmark provides technical support through a toll-free hotline; a 24-hour support BBS will soon be up and running, which will double as a source for new printer drivers. What's more, in an ambitious program dubbed "Operation Resource," Lexmark will recycle toner cartridges free of charge on behalf of IBM LaserPrinter customers in the U.S.

A fully loaded 10L gets expensive very quickly. Fortunately, it doesn't need the extras to do the job. The PCL compatibility and the 750-sheet capacity will easily fit the bill for most medium-sized networks. ■

300 *dpi*

&

600 *dpi*



QMS introduces a PostScript printer of extremely strong character.

The new QMS-PS® 815 MR™ print system gives you 300 x 300 dpi and true 600 x 600 dpi Adobe® PostScript® printing at your fingertips. Extremely sharp, crisp characters, fine line detail and clear halftones make this the reliable, affordable eight-page-per-minute printer you're after. See how the following features plus QMS National Service and free technical support will keep your 815 MR (and you) looking sharp.

- True 600 x 600 dpi delivers four times the gray levels as 300 x 300 dpi for clear halftones
- Connects to IBM® or compatible computers, Apple® Macintosh® computers & most mini computers & mainframes simultaneously
- Automatically switches to 300 x 300 dpi mode when needed for HP® applications
- Interprets incoming printer language (HP or PostScript) and switches automatically

For more information on the QMS-PS 815 MR, or on any other QMS® PostScript printer, call today. Or Fax QMS Product Information at 205-633-4866.

1 800 GET HI-RES EXT. 35
1 800 438-4473

QMS 
Where Imagination Leads

The following are trademarks or registered trademarks of their respective companies:
QMS, QMS-PS, MR and the QMS logo of QMS, Inc. Adobe, PostScript, and the PostScript
logo of Adobe Systems, Inc. IBM of International Business Machines Corp. Apple and Macintosh
of Apple Computer. HP of Hewlett-Packard Company.

CIRCLE 210 ON READER SERVICE CARD

First Looks

The Latest Laptops: AST's Speedy 25-MHz SX; Toshiba's Lightest Ever

PREVIEW
by Christopher Barr

AST Premium Exec 386SX/25

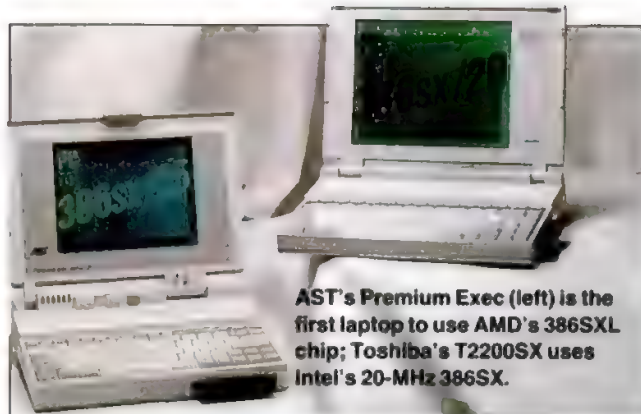
AST is the first major notebook manufacturer to break Intel's stranglehold on the SX market by using Advanced Micro Devices' low-powered 25-MHz AM386SXL processor. The AST Premium Exec 386SX/25 is the first SX notebook to ship using a non-Intel processor.

At 25 MHz, the Premium Exec is the fastest 386SX notebook available. Its design is a reprise of AST's popular 7-pound 386SX/20 ("386SX Laptops: Desktop Power, Notebook Size," August 1991), but was clearly 20 percent faster than the 20-MHz Intel-based machine in PC Magazine Labs' benchmark tests. The AMD

processor revealed no compatibility problems or conflicts running the full suite of tests.

The \$4,795 price is nearly twice that of AST's 386SX/20's \$2,995, although the SX/25 machine offers 60MB more storage. The preview unit we tested came with 4MB of RAM, a 60MB disk, and DOS 3.3. Production units will be upgradable to 8MB of RAM, have an 80MB hard disk, and DOS 5.0.

You also get more battery life than with AST's SX/20 machine. The 386SX/25 took 2:56 minutes to discharge fully with all power management features disabled, compared with the SX/20's 2:38. You can do even better by invoking the SX/25's power-down utilities that turn the disk and screen off at user-selectable intervals. Since the AM386SXL is a fully static chip, it can be powered down to 0 MHz without losing the con-



AST's Premium Exec (left) is the first laptop to use AMD's 386SXL chip; Toshiba's T2200SX uses Intel's 20-MHz 386SX.

tents of its registers. AST operates the chip at three speeds: 25 MHz, 8 MHz, and 2.5 MHz in standby mode.

The machine has a full complement of ports including a dedicated mouse/keypad so you won't tie up your serial port. The external video port will sense if a display adapter is attached and go to the CRT instead of the LCD.

Although AMD is the first company after Intel to make its own 386SX and 386DX chips, more are on the way. Chips and Technologies is introducing a line of Intel-compatible chips (see Pipeline, pages 29 and 30) and companies including Cyrix, IBM, and NexGen are looking

into alternative CPU production. A more diversified market should produce more machines like AST's Premium Exec 386SX/25—machines with more power, specialized functions, and competitive pricing. ■
List Price: AST Premium Exec 386SX/25, with 4MB RAM, 80MB hard disk, DOS 5.0, \$4,795. AST Research Inc., 16215 Alton Pkwy., P.O. Box 19658, Irvine, CA 92713-9658; 714-727-4141.

CIRCLE 701 ON READER SERVICE CARD

Toshiba's 5.5 Pound T2200SX

The Toshiba T2200SX could be one of the best notebooks ever. At 5.5 pounds, the Toshiba 20-MHz T2200SX is the lightest SX notebook with a built-in floppy disk. The machine is housed in the classic notebook-sized 1.6- by 11.7- by 8.3-inch (HWD) case. Its 9.5-inch diagonal display is a full one inch larger than previous Toshiba notebooks, and the T2200SX still lasts for more than 3.5 hours on a charge.

The standard configuration is 2MB of RAM and either a 40MB or 60MB hard disk. Additional RAM, up to 10MB, can be added in the form of one credit-card-sized RAM module that conforms to the JEIDA (Japan Electronic Industry Development Association) spec. RAM upgrades are costly: 2MB is \$479; 4MB is \$889; 8MB is \$1,779.

It took an advance in plastics technology for Toshiba to trim down the weight to 5.5 pounds and still keep the machine fully loaded. Toshiba uses a new car-

CONTINUES ON PAGE 46



BENCHMARK TESTS: AST PREMIUM EXEC 386SX/25 AND TOSHIBA T2200SX

The AST Premium Exec uses the brute force of AMD's 25-MHz 386SX chip to achieve the best 80386 Instruction Mix score here. While both the Compaq LTE 386s/20 and the Toshiba T2200SX feature Intel's 20-MHz 386SX, Compaq performs better thanks to its 4K processor RAM cache. Neither AST nor Toshiba features a memory cache.

■ The **Instruction Mix** benchmark test times a series of tasks specific to the processor. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

■ The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at relatively slow access speeds.

■ The **DOS File Access** score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test measures disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

Toshiba T2200SX
Compaq LTE 386s/20
AST Premium Exec 386SX/25

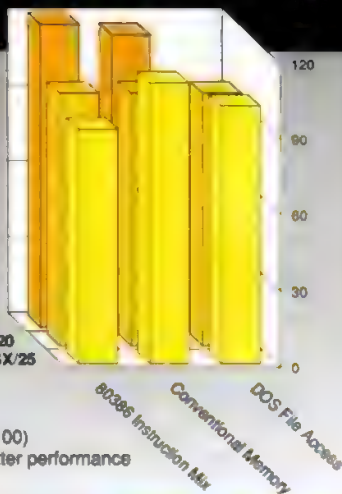
Relative Times

(Compaq LTE 386s/20 = 100)

Shorter bars represent better performance

Performance Times (Times given in seconds)

	80386 Instruction Mix	Conventional Memory	DOS File Access
Toshiba T2200SX	3.70	0.52	41.38
Compaq LTE 386s/20	3.09	0.45	66.49
AST Premium Exec 386SX/25	2.86	0.50	67.71



Our New Departmental PostScript Printer Is So Efficient, You Might As Well Say It Prints Money.

1991
Increased office efficiency
results in increased profitability

Efficiency – The QMS Watchword Of The '90s

Maintaining one high-duty printer rather than 30 to 40 desktop printers is a cost advantage. That's good. But the real advantage comes when the speed, intelligence and flexibility of the new QMS-PS® 2000 changes an office cost advantage into a departmental profit center!

Easy Connectivity In All Popular Business Environments

The QMS-PS 2000 is perfect for mixed computing environments. It connects easily to EtherNet® or Token Ring® networks to accept TCP/IP, DECnet®, LAN Manager, NetWare® and EtherTalk™ protocols.* Whether your network includes IBM® PC's and compatibles, Macintosh®, DEC® or UNIX® systems, the QMS-PS 2000 is your most efficient solution. It features AppleTalk®, RS-232C serial, Centronics®/Dataproducts® parallel and network interfaces that accept data simultaneously. That means the 2000 can easily serve large, multi-system networks. Its advanced spooling capability virtually eliminates workstation waiting time by storing each document as it's received and printing each in turn. And the 2000 does all this automatically to save time!

True Adobe PostScript Flexibility Plus Automatic Emulation Switching

Now departmental documents can have personality thanks to the 2000 and Adobe® PostScript®. Forty-five resident fonts can be scaled and rotated for effective charts and graphs. And because PostScript is the industry standard, you'll have thousands of useful applications at your fingertips. Switching to non-PostScript applications is literally automatic. QMS's exclusive ESP® technology (Emulation Sensing Processor) interprets incoming data and automatically chooses the appropriate printer language. PostScript, HP® LaserJet® IIP, HP-GL®, LN03® Plus and other emulations are recognized automatically!

Worldwide Service And Support

QMS® is recognized as the leader in advanced PostScript printing technology. Free technical support and our network of service experts are standing by.

Call today and find out how the time-efficient, cost-efficient QMS-PS 2000 can be a departmental profit center for your company. Or FAX QMS Product Information at (205) 633-4866.

Features That Add Up To Lower Per-User Cost

- MIPS R3000 RISC-based internal controller for super-fast page processing
- 8 MB RAM standard, expandable to 16 MB
- 1.44 MB, 3 1/2" floppy drive to load fonts or emulations into RAM or onto hard disk
- QMS proprietary ASAP™ IV technology speeds PostScript processing time
- 20 pages per minute
- 70,000 plus page-per-month duty cycle
- 1500 sheet input and output capacity
- Letter-/A4-, legal, 11"x17"/A3- and executive-size printing capabilities
- Duplexing feature prints on both sides in one pass
- Easy-to-read, multilingual LCD front panel to easily configure printer
- Document handling features include tumble printing, collation, offset stacking and automatic jam recovery.

1-800-523-2696 EXT. 34

QMS
Where Imagination Leads™

The following are trademarks or registered trademarks of their respective companies: QMS, QMS-PS, ASAP, and the QMS logo of QMS, Inc. Adobe and PostScript of Adobe Systems, Inc. EtherNet of Xerox Corp. IBM and Token Ring of International Business Machines Corp. AppleTalk, EtherTalk and Macintosh of Apple Computer, Inc. NetWare of Novell, Inc. DEC, DECnet, and LN03 of Digital Equipment Corp. HP, LaserJet, and HP-GL of Hewlett-Packard Company. Centronics of Centronics Data Computer Corp. Dataproducts of Dataproducts Corp.

*Contact QMS for availability of network options.

*Patent pending



CIRCLE 141 ON READER SERVICE CARD

First Looks

Toshiba's 5.5 Pound T2200SX

CONTINUED FROM PAGE 44

bon fiber-reinforced plastic that is thinner, yet stronger than the plastic that had been used. Next, Toshiba shaved 1/8 inch from the edge keyboard keys to make it fit the smaller form factor. Even with the trimmed keyboard it remains a full-sized 82-key keyboard with the same layout and spacing as the larger T2000SXe.

The motherboard is folded using a technology pioneered by the aerospace industry and first used in the Compaq LTE 386 5/20 called Rigid-Flex. Rigid-Flex is a flexible coated circuit tape that extends from inside the epoxy layers of the motherboard allowing the board to be folded.

Toshiba also used a floppy disk drive that is under 3/8 inch thick—the thinnest available.

Using a nickel hydride battery, the T2200SX made the best showing ever of any SX notebook tested by PC Magazine Labs. On our battery run-down test it consistently took more than 3.5 hours to drain the battery. And that's without any of Toshiba's power-saving utilities enabled. The unit has power-conservation features that power the CPU down to 5 MHz and shut the display and hard disk down in user-specified intervals from 3 to 30 minutes.

Toshiba's acclaimed AutoResume mode, a sort of electronic bookmark that will let you put the computer into a sleep state and have it awaken to where you left off, is idiot-proof. Even if you setup the T2200SX for boot mode (with no AutoResume), it will revert

to AutoResume mode when the battery is almost dead and save your data for you anyway. Toshiba's is also one of the few resume modes that works with Windows in Enhanced mode.

The power supply is no longer a bulky brick; it's a sleek tile that weighs under 14 ounces. The power supply is intelligent, too; it senses the battery's level as it charges. A full charge usually takes two hours.

Some accessories won't be ready when the T2200SX ships. The internal 2,400-bps MNP 5 modem won't be ready until November. The docking station that attaches to the 150-pin adapter won't be available immediately either. This docking station is specific to this unit and other Toshiba models to follow.

You have to dig deep to find criticisms for the T2200SX. Here are a few: The mouse port and keypad covers detach and

can be lost easily. The sidelit LCD could be brighter, and it still scans only 400 lines in VGA text mode. (You can fix the text mode to display full screen by using Personics *UltraVision for Laptops*.) You also can't use a 386 extended memory manager when you have AutoResume mode enabled.

Toshiba's 20-MHz 5.5-pound notebook has the best combination of features of any SX—weight, screen real estate, storage and speed. A notebook this light and this long-lasting can let you get some real work done on the road.

List Price: Toshiba T2200SX, with 2MB RAM, 40MB hard disk, \$4,499; 2MB RAM, 60MB hard disk, \$4,799. Toshiba America Information Systems Inc., 9740 Irvine Blvd., Irvine, CA 92718; 800-334-3445.

CIRCLE 707 ON READER SERVICE CARD

High on Security, Low on Error: MicroPorte Builds One for the Road

HANDS ON
by Joe Salerno

The advent of powerful and affordable laptop and notebook PCs has led to the need for reliable portable data communications—and that translates to a need for modems that can handle the wide variations in the quality of the phone lines. Microcom's MicroPorte series of 2,400-bit-per-second modems rises to the challenge.

The MicroPorte 542 (\$449; not reviewed here) supports MNP Levels 2 through 4 and V.42 for error control, and MNP 5 and V.42bis for data compression. The top-of-the-line MicroPorte 1042 (\$649) adds support for MNP 10 error control, as well as features that make data communications more secure. It includes support for the proprietary Microcom Turbo MNP mode, which increases modem speed to 4,000 or 3,200 bps when connected with another MNP 10 modem.

The 1042 measures 4.5 by 2.5 by 1.5 (HWD), and weighs

about 10 ounces. There are four LEDs on the top that indicate power on, low battery, connection speed, and DTR active. The serial connection port is 9 pin; however, an 18-inch cable that has both 9-pin and 25-pin connectors on the computer end is included, making it easy to connect it to any type of system. The modem uses the Hayes-style AT command set, with the Microcom "\\" commands; it also has a number of extended commands that control its specific features. A copy of Microcom's *Carbon Copy Plus 6.0* remote-access software is included in the package.

The modem is powered by either an external AC adapter (included), or through built-in rechargeable batteries. The batteries provide about 2 hours of on-line power or 30 days of backup power to the modem's configuration RAM.

One interesting feature of the MicroPorte 1042 is that it includes parameters that adjust the modem for use with cellular phones, compensating for de-



MNP 10 and a host of security features make the MicroPorte 1042 a good traveling companion.

lays and static. You can also configure the modem remotely.

Data security can be enhanced by configuring the modem to only accept calls from another MNP modem that has the same password. Another security feature is "auto-logon": The modem can be set to run a password-protected log-on sequence that must be accepted by either the remote modem or computer before the connection is completed. Two log-on sequences can be stored in the modem's RAM.

I conducted informal tests of the modem's error control on the worst phone lines I could find (those of a hotel room in New York City, with line noise that was audible), and the modem performed admirably. Re-

liable connections were made to a number of on-line services and BBSs, and the modem never lost the connection, even though it sometimes took over 2 seconds for the modems to recover after a burst of static.

The MicroPorte 1042 is versatile but expensive. It's ideally suited for situations where security is important, or where the bulk of your communications are going via a cellular phone. But if all you need is error control, the 1042 may be overkill, and the MicroPorte 542 or other V.42 modem will suffice.

List Price: MicroPorte 1042, \$649. **Requires:** PC with 9-pin or 25-pin serial port. Microcom, 500 River Ridge Dr., Norwood, MA 02062; 800-822-8224.

CIRCLE 431 ON READER SERVICE CARD



Another state-of-the-art Laser Beam Printer from the people who perfected the art.

Canon takes Laser Beam Printing another step further with the new Canon LBP®-4 PLUS. This amazing printer offers superb Automatic Image Refinement, and gives you the option of genuine Adobe® PostScript®.

But then, Canon has always been at the forefront of Laser Beam Printing technology.

Our replaceable cartridge helped make Laser Beam Printers compact and virtually maintenance-free. Built-in scalable fonts offered greater flexibility.

And now, Automatic Image Refinement in the new LBP-4 PLUS and LBP®-8 Mark III PLUS automatically smooths out jagged edges and curves to perfect all your printouts—from text to graphics. And Adobe PostScript lets you print all your PostScript files.

Call 1 (800) 848-4123 for information on our complete line of Laser Beam Printers. And let the people who perfected the art improve *your* image.



Adobe® PostScript® and the PostScript logo are registered trademarks of Adobe Systems Inc. in the U.S.A.
Canon® and LBP® are registered trademarks and Mark III T and Mark III R are trademarks of Canon Inc.
© 1991 Canon U.S.A. Inc.

CIRCLE 187 ON READER SERVICE CARD

Canon
LASER BEAM PRINTERS

Working To Improve Your Image.™

First Looks

BeyondMail: E-mail that Plays by the Rules

HANDS ON
by Rick Ayre

Have you ever wished for an e-mail drone? An intelligent assistant to separate the wheat from the chaff and put things in tidy packages? With a little bit of effort, *BeyondMail*, a \$695 product from Beyond Inc., lets you do just that. It's an ambitious network application development environment that allows you to create rules to automatically manage your e-mail.

In addition to its novel rule-based component, *BeyondMail* is a complete e-mail system. It offers most of the features you'll find in top-shelf e-mail packages, such as *cc:Mail*, *Da Vinci eMail*, and *Microsoft Mail for PC Networks*. It provides editing features, handling options, public and private address books, multiple attachments, and remote access capabilities. It also has the ability to move messages to and from folders. And while *BeyondMail* is strong enough to be your only e-mail system, it can also be installed easily alongside an existing e-mail system because it provides utilities to synchronize its address information with other popular products.

At the heart of *BeyondMail* is a powerful scripting language called *BeyondRules*, which you can use to manage your e-mail for you. The language can do simple things like prioritize your incoming messages, or more-complex things, like completely handle messages during your vacation. For example, you could have the system forward only your important mail and have it respond to messages by telling the senders where you are and how to get in touch.

You can use *BeyondRules* to build workgroup applications, such as group scheduling, or to create complete information access applications, like launching DOS applications to retrieve the latest stock quotes from an

on-line service and then placing the retrieved information into a batch of outgoing messages.

BeyondRules searches for messages based on criteria you set and then takes some action that you specify. The language enforces a strict syntax: It insists that each language statement be a rule. Rules are stored in sets and are fired off in the order they appear. A rule must consist of a WHEN event, followed by one or more IF conditions, and concluded by THEN actions. Though the syntax is strict, it is English-like in its phrasing, and rich in functionality.

You can create rules in three ways. The easiest is to interactively fill in forms using the Rule Editor. That way you can answer prompts, pick from lists, cut and paste, and let *BeyondMail* worry about the syntax. Next, you can add variables and functions to these simple form-based rules. Finally, you can create complete rule scripts in your favorite text editor.

Beyond Inc. goes to great lengths to make the language accessible. The *BeyondRules* manual is chock-full of examples that are both informative and inspirational. An entire disk

of sample *BeyondRules* applications (complete with source code) ships with each package and includes examples of general e-mail filters, filters for phone messages, queries of a main mailbox from a remote (laptop) mailbox, a group schedule manager, and an Important Issue tracker that assigns unique IDs to each topic and tracks each individually.

The *BeyondMail* server edition is installed on your network file server, so it requires the help of a system administrator. It will run on all the popular networks, including those from Novell, 3Com, IBM, and Microsoft; but it requires MHS (message-handling service). Early shipments come bundled with Novell's *MHS*, which can be exchanged for versions that run on the other LANs.

We installed *BeyondMail* on a Novell network running *NetWare 3.11* and Novell's *MHS*. Though the install program must be run by someone with supervisor privileges, it did not require the expertise of a supervisor.

For now, *BeyondMail* is a character-mode application on the file server and user's PC. The interface is based on four screens: one to manage folders, the Rule Editor, a Rule Manager to manage rule sets, and a forms screen for creating and reading messages. A forms editor is promised. The forms screen uses six forms that are specific

**FACT FILE**

BeyondMail
Beyond Inc., 38 Sidney St.,
Cambridge, MA 02139; 617-
621-0095.
List Price: Server (*MHS* and
5-node version), \$695; 5-node
expansion, \$395; 20-node
version, \$1,395.
Requires: 286-based PC or
better; 1MB RAM; 2.5MB hard
disk space; DOS 3.1 or later;
Novell's *MHS*, Version 1.1 or
later. Works with *LAN
Manager*, *NetWare*, *PC LAN*,
3+ *Share*, or *VINES* networks.
In Short: All the basic e-mail
functionality plus a next-
generation rule-based
development environment that
lets you build applications to
manage your e-mail.

CIRCLE 480 ON READER SERVICE CARD

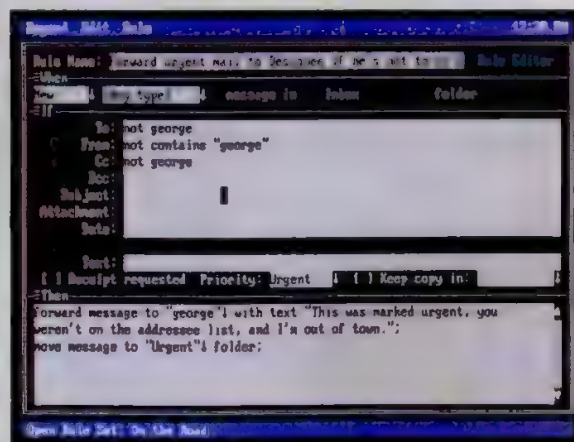
to various message types.

All of the *BeyondMail* screens are somewhat CUA-compliant, with mouse support and plenty of familiar-looking scroll lists and dialog boxes.

But there are reasons to look beyond *BeyondMail*. For one, it doesn't have a *Windows* front end, though Beyond Inc. promises one soon. *BeyondMail* also requires a lot of system resources on workstations and requires that workstations must be 286-based PCs or better with at least 1MB of RAM. In addition, it requires that *MHS* be running, even in a single host workgroup. This can add a level of complexity to running and administering e-mail.

Finally, it's important to realize the nature of the *BeyondMail* beast. Because you have to create rules to take advantage of *BeyondMail*, the software enters into the realm of an application development environment, not a ready-to-use application.

Moving to *BeyondMail* requires a certain sense of commitment. If you are looking to build applications to more efficiently manage your network e-mail, *BeyondMail*'s rule-based language is particularly well suited to the task. If you are ready to move beyond basic e-mail to a messaging system that can reduce information overload and enhance workgroup productivity, then you are ready for *BeyondMail*. ■



BeyondMail's BeyondRules uses WHEN-IF-THEN constructs to intelligently manage your e-mail.

File Edit Worksheet

(C0) [W12]

A:E10

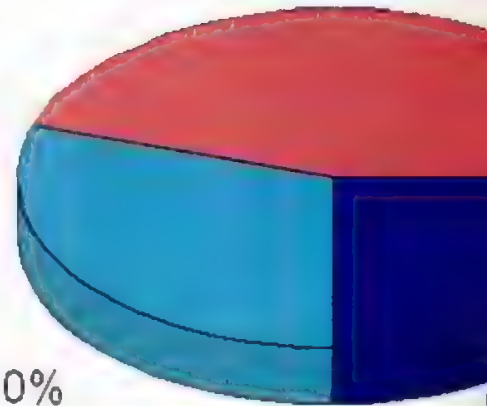
@SUM(B

	A	B
9		
10	Revenues	\$1,260,000
11	Costs	\$850,000
12	Profit	\$410,000



Market Share

45.0%



30.0%

Don't miss it!

Now, when you buy your new ZEOS
Windows system, you're going to
get more than you bargained for!



1-2-3 for Windows



Amipro



WinRIX-DCS



1-2-3[®] for Windows

Now included in every



For a limited time only, ZEOS Windows systems buyers will also receive Lotus 1-2-3 for Windows plus Ami Pro 2.0, the Lotus Word Processing package for Windows. Complete and fully documented!

Your new ZEOS Windows system includes Microsoft Windows Version 3.0 plus a genuine Microsoft Mouse.

Unbelievable? Believe it! Because now, when you buy any new ZEOS Windows[®] system, you will also receive Lotus 1-2-3 for Windows plus Lotus' new word processor for Windows, Ami Pro[™] 2.0 at no additional charge!

It's the ultimate bundle! First, you're going to be receiving the incredible new ZEOS modular system complete with the upgradable CPU of your choice. These new ZEOS systems are the hottest computers money can buy. And that's just for starters.

Because you're also receiving the hottest software money can buy. Yet you don't have to buy it. Because we're including it at *no additional charge*. Go ahead and pinch yourself, it's really true!

And not only are you receiving the *amazing* new Lotus 1-2-3[®] for Windows and Ami Pro 2.0, you're also getting Microsoft[®] Windows itself, plus a genuine Microsoft Mouse plus Microsoft DOS 5.0. All included at one low package price.

These are not some scaled down versions or trial disks either. They are the *complete* and *fully documented* editions of Lotus 1-2-3 for Windows and Lotus Ami Pro 2.0 for Windows provided to you by special arrangement between ZEOS and Lotus. This is one incredible value that no one else can offer. You're going to love it, too.

Because nothing else brings out the power of the most powerful software like your blazing new ZEOS system. And when you strap your-

plus Ami Pro[®] 2.0!

ZEOS Windows System.

The foundation of your new ZEOS Windows system is the computer itself. You'll get an upgradable processor module, super-fast 53ns DRAM, a 300 Watt power supply, and lots of bays and slots for future expansion. The hardware simply can't be beat.



Wrap your Windows system up with the latest and greatest DOS version, Microsoft DOS 5.0! Fully featured and fully documented. You're going to love it!

self in and fire up *Windows* with Lotus 1-2-3 and *Ami Pro*, you're in for the ride of your life!

After all, nobody knows spreadsheets better than Lotus. And when they sat down to write *1-2-3 for Windows* they created a masterpiece. It starts out as a full-fledged *Windows* application. Offering that perfect balance of power and simplicity, it remains fully compatible with all the earlier versions of 1-2-3. And it's absolutely loaded with new features.

Power, Simplicity, complete Compatibility *plus* loads of new features. It's Lotus 1-2-3 for *Windows* and it comes with every ZEOS *Windows* system. And so does *Ami Pro 2.0*!

After all, *Ami Pro 2.0* is the Lotus word processing program that was designed for

Windows from the ground up. Linking with a full suite of *Windows* applications *including* your new Lotus 1-2-3 for *Windows*, *Ami Pro 2.0* is perhaps the finest word processor on the market today.

Buying your new ZEOS *Windows* system is possibly the best purchase decision you'll ever make. Then add to it Lotus 1-2-3 for *Windows*, *Ami Pro 2.0* plus *Windows 3.0*, *DOS 5.0* and a genuine Microsoft mouse. It's an offer that can't be beat and one we simply can't offer for long. So pick your new ZEOS *Windows* package now and we'll include a bundle! **Call now 800-423-5891!**

Upgradable. High Performance. Low Cost. And every ZEOS Windows system comes with Lotus 1-2-3 for Windows and Ami Pro 2.0 at no additional charge. Absolutely incredible!

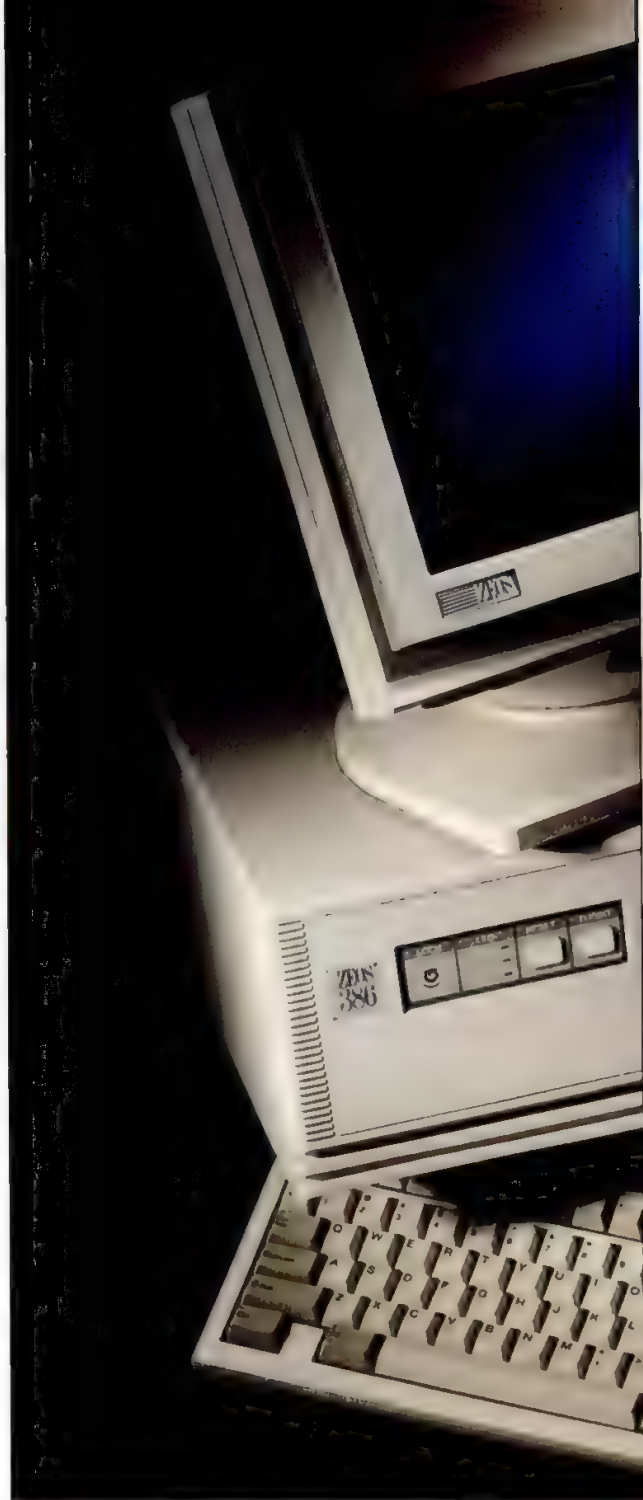
With ZEOS 386-25s starting at only \$1395 right thru '486-33MHz systems starting at \$1795, computing will never be the same again! And it's not just the prices that make these new systems hot. It's Performance and Upgradability as well.

**UPGRADABLE
CPU**

When we first sat down to design these new systems, we wanted computers that would *blow the doors off* anything else out there. Plus, we wanted you to be able to upgrade from one CPU to another as your computing requirements changed, *without having to buy an entirely new system*. The results?

Incredibly low cost, high performance systems so very advanced you can move freely from the '386 family of processors to the latest '486s all without a moment's hesitation.

Now, you can pick your power! Today *and* tomorrow. Choose from high speed '386-25 and 33MHz systems, either cached or non-cached, plus the '486SX and '486-33MHz with or without a secondary cache. Whichever you decide upon you know that as your computing requirements change, your processing power can change as



Upgradable.

Hot New ZEOS'386



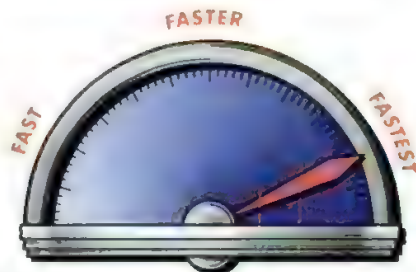
well. But are the prices really that good?

Yes. *Absolutely Yes!* The prices really *are* that good, and the quality too. Because when you buy from ZEOS you're buying directly from the manufacturer. Starting with the main system board, your new computer is designed and built by us right here in Minnesota. That saves money for you. And your ZEOS factory direct advantages are evident not only in the price, but in the performance and quality of your system too.

Not only that, but your new ZEOS system is supported around the clock by our 24 Hour a Day Toll Free technical support hotline. Should you have any questions, we're here to help, 24 hours a day, 365 days a year!

So if you're looking for a high speed, upgradable, rock solid system supported like none

other *and* you want incredibly low prices, you've found your company. And your computer. Read on!



Z•SPEED METER

To help you select the processor option that's right for you, we have developed the Z-Meter. The Z-Meter shows you the relative performance gains achieved by moving from one processor module to another—fast, faster, fastest! No matter which system you select you can be sure of one thing—these babies are Hot!



Low Cost.

and '486 systems!



ZEOS COMPLETE SYSTEM PACKAGE #1

- The Processor and Speed of your choice plus future upgradability!
- 1MB of High Speed 53ns DRAM, expandable to a system total of 32MB right on the motherboard.
- 42MB High Speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots, 80387 math co-processor support for '386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

PACKAGE #1

INCREDIBLE ZEOS PACKAGE #2

We take Package #1 and upgrade your ZEOS Modular System to include:

- 2 full Megabytes of Rip-roaring 53ns DRAM.
- Our incredible 85MB IDE hard drive with its own built in cache.
- Both the Teac® 1.2MB and 1.44MB floppy drives.
- The awesome Diamond SpeedStar Plus VGA graphics card Complete with 1MB DRAM.
- ZEOS 14" High Res VGA Mono Monitor with Tilt & Swivel base.
- Lotus 1-2-3 for Windows, plus Ami Pro 2.0, plus Microsoft Windows and DOS 5.0, plus a genuine Microsoft mouse!

PACKAGE #2

ZEOS. Your



For Vertical Systems add only \$150.

486-33	\$1795
486SX-20	\$1595
386-33	\$1495
386-25	\$1395

Harnessing the ZEOS power and value you want is easy. Pick your processor then your package. Package #1 gets you up and running for a very reasonable price. To add even more options *and*

savings select from Packages 2, 3 or 4.

Because when you select from Packages 2, 3 or 4 you receive VGA, additional memory, larger drives and more. You also receive *Windows 3.0* plus *Lotus 1-2-3 for Windows* plus Lotus' great new *Windows* word processor *Ami Pro 2.0*, plus *Microsoft DOS 5.0* plus a genuine Microsoft Mouse. Nobody gives you this combination of hardware *and* software power. And it's yours, all for one low package price!

And that's just for starters. Because *inside* your new ZEOS system rests the very latest advancements in surface mount, high integration technology. As an example, we have freed two normally occupied expansion slots by placing our high speed IDE hard drive and floppy drive interfaces right on the main board. Then, we put the high speed serial, parallel and game ports on the motherboard too. The result?

Eight expansion slots, *seven* of which are available for your future use! After all, expansion and non-obsolescence are what these great new ZEOS systems are all about. We've built in some other very important expansion features for you as well.

Like our *300 watt* power supply. Providing you with all the pure clean power you'll need right now, your ZEOS 300 watt supply also provides you with plenty of power for the future as well. Plenty of slots, plenty of power. How about space? This is where ZEOS has performed something akin to magic.

It's your new ZEOS SpaceSaver case! Complete with *seven drive bays*, this incredible case is actually *smaller* than many cases offering only five bays. We've also added a *second whisper quiet cooling fan*. Why? Because whether you expand your system or not, the cooler it

486-33	\$2395
486SX-20	\$2195
386-33	\$2095
386-25	\$1995

Best Value!



486-33	\$2895
486SX-20	\$2695
386-33	\$2595
386-25	\$2495

runs, the longer it will last. Now that's *ZEOS value*. Speaking of which. How about UL* listings?

Right now every ZEOS system is UL* listed. This listing means your entire system (not just the power supply) has met stringent safety requirements of Underwriters Laboratories. We believe

UL* listings also say a lot about quality. And UL* safety listings are something many of our competitors simply don't (or can't) provide. At ZEOS quality and safety are important to us. *You* are important to us.

Price. Performance. Quality and Support.

There are *many* reasons to buy your new ZEOS upgradable system. Plus, your ZEOS advantages include *24 Hour a Day Toll Free* Support and our *30 Day Money Back Guarantee* and ironclad warranty (for more ZEOS advantages see the section entitled "*Why ZEOS is Your #1 Choice*").

Selecting your new ZEOS system is easy. Choose from any of the money saving packages shown here. Or let your friendly and knowledgeable ZEOS Systems Consultant help you configure exactly what you want from our huge selection of upgrades and options. Whatever you select, one thing is for certain.

Buying your new ZEOS system is perhaps the best purchase decision you'll ever make! Simply pick up the phone and give us a call now. Incredible ZEOS power awaits you! *Call now Toll Free, 800-423-5891.*

486-33	\$3395
486SX-20	\$3195
386-33	\$3095
386-25	\$2995



For Complete Processor and Package Pricing, simply turn the page!

Pick Your Package

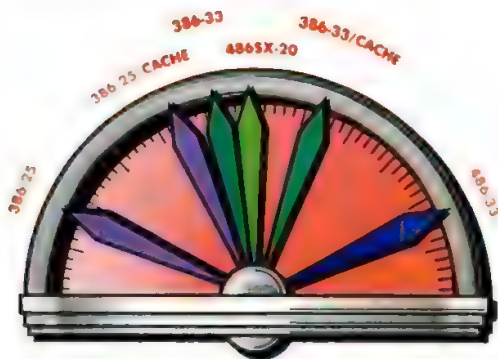
Or Let Us Custom Build to

Now, ZEOS lets you pick the power you want for the price you want to pay! Not only that, every ZEOS Windows System (Packages 2, 3 and 4) includes not only Microsoft *Windows*, *DOS* and a mouse—we're also including Lotus *1-2-3 for Windows* plus Lotus' new Windows word processor *Ami Pro 2.0*!

And with your new ZEOS modular system, the computer that's right for you today is also the computer that's right for you tomorrow. In the future, you can upgrade to even more performance with a new '386 or '486 processor module.

And that's only the start of your many ZEOS system advantages. But what more could there be than dazzling performance, incredible prices and upgradability? From ZEOS there's lots more.

Because your new ZEOS system is not only fast, it's absolutely loaded with features. Like our 300 watt power supply, eight expansion slots, twin cooling fans (for even more reliability) and our unique seven bay SpaceSaver case. And, every ZEOS system is UL® listed.



Z-SPEED METER

Let the "Z-Meter" help you pick the processing power that's right for you. The comparisons are easy to make. Fast, Faster or Fastest!

r Power, & Price!

Your Exact Specifications.

PACKAGES 2, 3 AND 4 INCLUDE LOTUS BUNDLE!

	Pkg. #1	Pkg. #2	Pkg. #3	Pkg. #4
386-25	\$1395	\$1995	\$2495	\$2995
386-33	\$1495	\$2095	\$2595	\$3095
486SX-20	\$1595	\$2195	\$2695	\$3195
486-33	\$1795	\$2395	\$2895	\$3395

Add \$200 to any price for a 128K cache.

In addition to all of these standard ZEOS advantages, you're also receiving our legendary ZEOS Technical Support, *24 Hours a Day, 365 Days a Year*. Plus, our 30 day Absolute Satisfaction Money Back Guarantee and more!

So pick your Power, and your Price *then give us a call!* Your expert ZEOS Systems Consultant is ready to answer any questions you may have. Why not give us a call right now, Toll Free at 800-423-5891.

INCREDIBLE ZEOS PACKAGE #3

Add even more memory, a larger drive. And more Savings! You now receive:

- 4 full Megabytes of Ultra High Speed 53ns DRAM.
- Our fast 130MB IDE hard drive with built in cache.
- Both Teac® floppies, the 1.2MB and 1.44!
- Your Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 plus a Microsoft mouse!

PACKAGE #3

THE ULTIMATE ZEOS PACKAGE #4

Now, Memory goes to 8MB and the drive to 210MB. The ultimate Power User's Dream Machine!

- 8 full Megabytes of High Speed 53ns DRAM.
- Your screaming 210MB IDE hard drive with its own built-in cache.
- Both Teac® floppies, the 1.2MB and 1.44!
- The Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 plus a Microsoft mouse!

PACKAGE #4

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders: 612-633-1325

Hearing Impaired (TDD):

800-228-5389

Govt. & Educ.: 800-245-2449

Outside US and Canada

Call: 612-633-6131

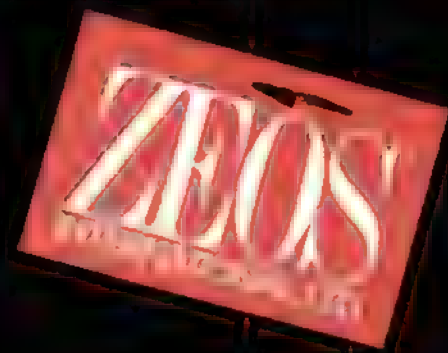
MasterCard, VISA, Discover,

Am Exp, Z-CARD, COD and

Leasing Programs.

Open 24 Hours a Day.

365 Days a Year!



Call to confirm current pricing, product specifications and configurations, all are subject to change without notice. Purchase orders subject to approval. Lotus, 1-2-3, Ami Pro, Classic and SmartIcons are trademarks of Lotus Development Corporation; Windows and Microsoft of Microsoft Corporation, Z Card, SpaceSaver, and ZEOS of ZEOS International, Ltd., 530 5th Avenue NW, St. Paul, MN 55112 USA © 1991.

Why ZEOS is

☒ Now, your ZEOS modular system allows you to upgrade from one CPU to another as your computing requirements change. Obsolescence is virtually obsolete!

☒ You may choose between a variety of '386 and '486 processor options, both cached and non-cached.

☒ Made in USA! Your new ZEOS system boards are designed and manufactured by ZEOS, right here in the USA.

☒ ZEOS has utilized the very latest in highly integrated surface mount technology. Faster, cooler, more reliable systems for you!

☒ Every ZEOS modular system comes standard with incredibly fast *53 nanosecond DRAM*.

☒ Plus, you may expand your system with up to 32 megabytes of memory right on the motherboard.

☒ Your new system features the *exclusive* ZEOS seven bay desktop case, smaller than most five bay cases yet plenty of room for future expansion.

☒ Two whisper quiet cooling fans move more cool air thru your system increasing reliability and component life.

CHECK YOUR EXCLUSIVE

If you're deciding which new computer to buy, there are many important considerations.

Here, we've gathered together a number of these considerations for your review. Some are of obvious importance,

**ZEOS.
Eight Times
Editor's Choice.**

☒ Your *entire* system is UL* listed (not just the power supply). Few others offer this security; we wonder why.

☒ Eight slots, one for the video, seven more open providing plenty of room as your system requirements grow.

☒ Two high speed serial ports, one parallel port and one game port.

☒ Our top quality 300 watt power supply provides you with plenty of power for your present *and* future needs.

☒ ZEOS uses *only* genuine Teac* floppy drives. Accept nothing less.

☒ Monochrome TTL systems feature Genuine Hercules* brand graphics controllers. Only the best for you.

Your #1 Choice!

ZEOS ADVANTAGES:

while others are subtle yet critical to your ultimate satisfaction. We'll go over them here with you one by one.

Please feel free to use these as a basis for comparison with other system vendors. We believe you will come away with the conclusion that ZEOS is indeed Your #1 Choice.

✓ VGA color systems feature the high-res ZEOS 1024x768 monitor with the incomparable SpeedStar Plus card complete with One Full Megabyte of memory!

✓ Special package savings are available incorporating our most popular upgrades. Many packages include Microsoft® DOS plus Windows and a Mouse!

✓ For a limited time every ZEOS Windows system also comes with Lotus 1-2-3 for Windows plus Lotus' incredible new Windows word processor *Ami Pro 2.0!*

✓ *PC Magazine* said ZEOS offers "more options than even the most configuration hungry hound could possibly need." Let us build whatever you require.

✓ Everybody loves ZEOS' 24 Hour a Day Toll Free Technical Support. You can call for advice any time of the day or night, 365 days a year!

✓ ZEOS systems have been selected by *PC Magazine* as *Editor's Choice, Eight Times!* These, along with many other consumer and industry awards attest to ZEOS' consistent and outstanding value.

✓ Your new system is backed by our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Replacement Policy.

✓ Buy with confidence. ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). We've been around since 1981. We'll be around for a long time to come as well.

✓ ZEOS offers you a wide variety of payment options including MasterCard, VISA, Discover, American Express plus our own Z-Card, the ZEOS credit card featuring low consumer rates. Credit terms are also available along with very attractive leasing programs to qualified corporate customers.

✓ Friendly, knowledgeable ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time.

When you add it all up, there's nothing like buying from ZEOS. There is certainly nothing like these new ZEOS systems!

**CALL NOW TOLL FREE:
800-423-5891**

Computers Now! SM

Take Your Pick. We'll Ship Today!

RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 or '486 today! We've built up an extra supply of the hottest selling computers in America in their most popular configurations.

Here's how it works. We have these incredible ZEOS '386 and '486 color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time M-F.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 or '486 systems configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.

*OUR GUARANTEE TO YOU:

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're the high performance, high quality ZEOS *upgradable* systems. Packing all the ZEOS value that has won PC Magazine Editor's Choice—*eight times!*

So why not give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.



**Yes! We can ship
your new ZEOS system
Right Now!
Place your order
by 1:00 PM Central
Time and we'll ship
today. Guaranteed!***

Our most popular '386 & '486 packages! 128K Cache, 130MB Drive, 4MB Memory and More. Ready to ship today!

'386-33 ONLY \$2795.

As a '486-33 ONLY \$3095!

- Upgradable CPU module allows you to change processors as your computing needs change!
- Ultra high speed Zero-Wait 128K SRAM Cache.
- 4MB of Zero-Wait 53ns DRAM, expandable to a Total of 32MB on the motherboard.
- Ultra Fast 130MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built in.
- 7-16, 1-8 bit expansion slots. Math coprocessor support for '386.
- Rugged ZEOS SpaceSaver Case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders:
612-633-1325
Minnesota:
612-633-4591
TDD Orders:
800-228-5389

Outside US and
Canada: 612-633-6131
MasterCard, VISA,
Am Exp, Discover, Z-Card and COD.
Open 24 Hours a Day, 365 Days a Year!



Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: Microsoft, MS-DOS and Windows of Microsoft Corporation, ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol: ZEOS. Lotus is a registered trademark of Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, a wholly-owned subsidiary of Lotus Development Corporation.

First Looks

Instant Digital Photography

HANDS ON
by Jonathan Matzkin

Imaging has always been one of the thorniest problems faced by low-end desktop publishers.

Scanners are not only expensive but also impractical. You can't really scan 3-D objects (people, for instance), and while photographs can be easily scanned, you must first shoot and process the image, which takes hours if not days. Dycam's \$995 Model 1 Digital Still Camera isn't a perfect solution, but it solves many of these

DTP imaging problems.

The Dycam differs from still video cameras in at least one crucial way. While still video systems like Canon's Xap Shot (First Looks, March 26, 1991) record analog images, which must be converted to digital form for use in PC documents, the Dycam stores its images in digital form, in the familiar, widely supported TIFF format. That means that you simply shoot the picture, transfer it to your hard disk with the included cable and software, and use it as you would any other TIFF image file.



The Dycam Still Camera captures images digitally—directly into TIFF format.

LOGITECH RELEASES VERSION OF STILL CAMERA

Many new hardware products are hampered initially by the lack of widespread third-party support and by the lack of effective software. So it bodes well for the future of low-cost digital photo imaging that Logitech has decided to enter the low-cost digital imaging market.

Logitech, one of the largest makers of input devices and associated software, has purchased Dycam's digital camera technology, and will manufacture and sell it with its own manipulation software for \$799. Logitech's version of the camera is physically very similar to the

Dycam, but has different firmware, according to a Logitech spokesperson. The hardware/software bundle, dubbed the FotoMan, is slated for an October release, according to Logitech.

As with the Dycam system, images are downloaded from Logitech's camera via a PC-based software module. Photos are displayed as a series of small preview images laid out like a photographer's contact sheet. They are then automatically imported into *FotoTouch*, an upgrade of Logitech's *Ansel* image-manipulation package, which has previously

This functional simplicity extends to the design of the camera itself. The Dycam is almost devoid of physical features. Its sleek, compact body (6.5 by 3 by 1.25 inches HWD) has a viewfinder for framing an image, and a single push button to snap the shot. Anyone who can use a conventional point-and-shoot camera can successfully use the Dycam within 5 minutes of pulling it out of the box.

The camera can hold up to 32 images in its internal memory. Images are transferred to your PC through a cable that attaches to the din plug on the host adapter and to any DB-9 serial port on your PC.

The DOS software included with the Dycam is rudimentary in terms of interface design and is not particularly feature-rich, but it is effective and simple to use. One feature lets you display miniature versions of the images transferred from the camera. Arrayed across your screen, the small images look like a photographer's proof sheet, and they serve a similar function. To view a full-sized image, you simply highlight one of the thumbnail images and press Enter.

The package also includes Windows software. The software has similar functionality, but it saves the images as .BMP

been sold with Logitech's ScanMan hand scanner.

A Windows application, *FotoTouch* provides a wide range of image-manipulation and file-conversion capabilities. The software allows users to store images in .BMP, .PCX, or any of three TIFF file formats, according to Logitech. Among other options, *FotoTouch* also allows images to be edited pixel by pixel, rotated, or stitched to other images. They can be stored in 16, 64, or 256 gray levels, and in dithered, error-diffused or black-and-white line art modes.—J.M.

FACT FILE

Dycam Model 1 Digital Still Camera

Dycam Inc., 9588 Topanga Canyon Blvd., Chatsworth, CA 91311; 818-998-8008.

List Price: \$995.

Requires: 286-based PC or better, hard disk, graphics adapter.

In Short: A digital camera that provides an easy way to incorporate photographic images into desktop publishing documents.

CIRCLE 708 ON READER SERVICE CARD

or TIFF files. It took some tinkering with protocols and data transfer rates to get either version of the software to run properly on my 486/33. Dycam says that the problem arises when the camera tries to transmit images at a high baud rate through a serial port on some systems. The company also plans to distribute *Picture Publisher* image-manipulation software with the camera in the near future.

As a camera, the Dycam is no threat to makers of conventional photo equipment. Its 376-column by 240-row resolution is high enough to generate a good image, but there is basically no comparison between the Dycam's output at VGA resolution and a conventional photograph. As the images are printed or displayed in larger sizes, image quality suffers.

The Dycam's simplicity is a two-edged sword. The fixed-focus lens is designed to capture images from approximately 3 feet to infinity. It works pretty well at longer distances, but there was noticeable distortion in a street scene that I snapped, particularly in the background. The lens is also unsuitable for extreme close-ups. Dycam offers wide angle, telephoto and close-up kit options at additional cost.

At around \$1,000, the Dycam Model 1 is a bit pricey to use as the family snapshot camera. But as prices come down, its ease of use and the instant gratification of seeing an image on-screen in a matter of seconds might make the Dycam as common as today's camcorders. ■

First Looks

Two Low-End Drawing Packages Make Fine Companions for Windows Graphics



CorelDRAW is overkill if all you need to do is sketch a diagram or recolor some clip art, but in the past, PC users hadn't had many alternatives. Now **VentanaDraw** and **WinDraw** widen the field. Both support **Windows'** full complement of 16.7 million colors and are adapted for exchanging files via the Clipboard or by exporting to **Windows Metafiles**.

Of the two, the most promising is **VentanaDraw**. This \$149 package is full featured for such a low-cost program, with support for masking, gradient fills, bitmap patterns, embedded bitmaps, text rotation, and other relatively high-end features. It imports and exports **Windows Metafiles** and has a simple screen-show utility and a menu builder shell that you can use to create graphical menus or interactive on-screen presentations.

Its drawing and editing tools, based on a customizable floating toolbox, are quite complete, and even include special tools for drawing orthogonal lines, rounded rectangles, and pie slices; there's also an arc tool. Drawing Bezier curves is a simple process, though you can't add or delete nodes. You can group objects, move them to the front or back, rotate them in selectable increments, align and flip them horizontally or

vertically, and lock them in place. Screen performance is good and you can throttle down to a draft or a wireframe mode.

The interface is easy to use, though there are a few quirks. There's no rubber-band zoom, and you can't constrain resizing to retain the aspect ratio. Since all functions are on the menus, you can use keyboard shortcuts and Recorder macros to automate your work, but the downside of this is that the menus are very full; moreover the Edit, Layout, and Format menus are somewhat poorly organized, with odd combinations of selections that are hard to remember. The reference manual explains the program, but there's no on-line help.

VentanaDraw's text handling includes full word-wrap text capabilities (though there's no tab or margin ruler), and you can import entire paragraphs of

text from a file or from **Windows'** Clipboard. The program works well with font managers like **Adobe Type Manager** and **SuperPrint**, and if you use Atech Software's fonts, you can convert text to curves. Other text editing methods demand improvement. Text editing takes place in a full-screen edit box, but you can't double-click on text objects to edit them.

Due to limitations of the **Windows Metafile** spec, you cannot export word-wrapped text; it disappears unless you specify it as rotatable, a trick that is not documented. Images are placed on the Clipboard in metafile format only, so you can't paste them as raster images into **PC Paintbrush** and like programs. **VentanaDraw** does not support some variations of the metafile format such as the one used in **PageMaker**; these strictures are expected to be fixed in a future version.

Its rival, **WinDraw** (\$79), is bare-bones, with few distinctive features. One is its true multiple document interface (MDI). The other is its symbol libraries, which let you create scrapbooks of images. You can paste images into your drawings, and link them into the original symbol, so that any changes made in the latter will be reflected in all your drawings.

WinDraw has an acceptable complement of drawing and editing tools, including Bezier

curves, to which you can add and delete nodes. And it has a better selection of line styles, widths, and endings than does **VentanaDraw**. It falters when it comes to text handling, though it handles all **Windows** fonts and word-wrap text boxes; it offers no text justification options and does not let you apply even plain color fills to text.

Using the program can be awkward as well. There are no object alignments, for instance, so you'll have to orient objects using the grid or rulers. Bezier curves are easy to draw but hard to edit; it's not obvious which control points go with which nodes. Grouped objects are similarly confusing on-screen, and the many screen redraws are distracting.

Image import and export options are richer in some ways than **VentanaDraw's**, poorer in others. **WinDraw** lets you export files either as metafiles (.WMF) or as bitmaps (.BMP), and it puts both versions on the Clipboard. On the other hand, it doesn't read anything but its own proprietary format, so the only way to get information into it is by pasting from the Clipboard. Several technical problems also surfaced: Its metafiles showed sizing problems, and **Windows** crashed several times when I tried to paste grouped images composed of several polygonal elements. **WinDraw** doesn't support Aldus' .WMF format. All in all, you're better off spending the extra money for **VentanaDraw**. ■

List Price: **VentanaDraw**, Version 1.2, \$149. **Requires:** 1MB RAM, 383K hard disk space, graphics adapter, mouse, DOS 3.1 or later, **Windows 3.0**. (At presstime, we learned that **ComputerEasy**, of Tempe, AZ (800-522-3279) bought marketing rights to **Ventana Draw** and planned a name change to **Drô**).

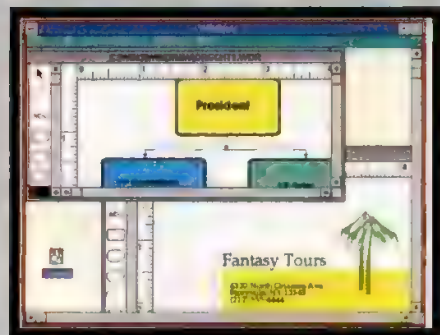
CIRCLE 433 ON READER SERVICE CARD

List Price: **WinDraw**, \$79. **Requires:** 1MB RAM, 416K hard disk space, graphics adapter, mouse, DOS 3.1 or later, **Windows 3.0**. Addison Research, P.O. Box 365, Addison, TX 75001; 214-960-7004.

CIRCLE 434 ON READER SERVICE CARD



VentanaDraw has relatively high-end features for its modest price.



WinDraw's multiple document interface support is a thoughtful addition to this bare-bones drawing tool.

SORRY, QEMM!



THERE CAN ONLY BE ONE WINNER.

And when it comes to memory management, PC Magazine picked NETROOM over QEMM and all the rest.

Why? Because NETROOM gives you up to 576K more memory by relocating LANs, device drivers, and TSRs, not only into High-DOS *between* 640K and 1Mb, but also into expanded or extended memory *above* 1Mb.

And, NETROOM is the only memory manager that runs on all PCs - 8088 through 80486. Not just with LANs, but even on stand-alone PCs!

That's why PC Magazine said "...it's a real winner...considering NETROOM's price and capabilities, you will find that there is no second choice."

Features:	NET-ROOM	QEMM	386 MAX
Windows 3.0 support	✓	✓	✓
Special DOS 5 support	✓		
Converts Ext. to Exp.*	✓	✓	✓
Relocates to High-DOS	✓	✓	✓
Relocates to LIM 3.2 Frame	✓		
Relocates to Expanded	✓		
Relocates to Extended	✓		
Works on 386/486	✓	✓	✓
Works on 8088/286	✓		
Memory Analysis Utility	✓		

*Requires NEAT ChipSet on 286 systems.

NETROOM IS THE ONLY DOS 5 MEMORY MANAGER

You'd think we'd have good-enough alone. But we made NETROOM even better. With special DOS 5 support like 286 expanded memory support, installation support through on-screen hot-key help, and more.

Plus, with NETROOM you get the essential memory analysis utility DISCOVER, a diagnostic tool that unveils the hidden potential of your PC!

SPECIAL LIMITED TIME OFFER!

QEMM users, don't despair. Just send us the title page from QEMM, or any memory manager manual, and you'll save 50% off the regular price of NETROOM.

Don't worry, this is a limited time offer - and we guarantee you'll know everyone knows a winner!

Call toll-free 1-800-421-1157, fax (718) 392-4212, or mail coupon to: **HELIX SOFTWARE CO. - SPECIAL OFFER** 47-09 30th St., L.L.C., N.Y. 11101 (718) 392-3100

YES!

Please send me NETROOM for:
☐ 1 user *\$79.95 s&h ☐ 4 user *\$149.95 s&h

YES!

I'd like to save 50% and trade up to NETROOM (1 user). I've enclosed the title page of any memory manager and *\$39.50 + s&h.

☐ Check ☐ MC ☐ Visa Exp. _____

Acct. # _____

Name _____

Address _____

City _____ State _____ Zip _____

Phone () _____

NYS res. add 8 1/4% sales tax. Allow 2-4 weeks for delivery.

HELIX SOFTWARE COMPANY

To support all of NETROOM's features on 8088/286 PCs you will need NEAT ChipSet or expanded memory hardware.

© 1991 Helix Software Co., Inc. NETROOM, DISCOVER, QEMM and 386MAX are registered trademarks of their respective corporations. *Used with permission © 1991 Bell Davis Communications, Inc. Editor's Choice awarded Jan. 29, 1991. CIRCLE 313 ON READER SERVICE CARD

First Looks

PC-File: All Dressed Up and Nearly Ready for Market

HANDS ON
by Catherine Gagnier

If you don't have the time, the patience, or the pocketbook for a relational database system, *PC-File* was made just for you. ButtonWare's flagship product, *PC-File* was first introduced in 1982 as shareware, and it enjoyed enormous popularity in that arena for several years. Its native *dBASE* file format, its convenient auto-dialer and calculator, and its ability to generate business graphs have made *PC-File* a favorite low-cost front end for *dBASE* systems. With Version 6.0 retailing at \$149.95, *PC-File* makes its debut in the commercial marketplace and aims to give its competitors a run for their money.

PC-File 6.0 sports a brand-new graphical interface complete with pull-down menus, dialog boxes, radio buttons, and mouse support. You can run the program in graphics mode if you have an EGA or VGA system, or text mode if you don't. Best of all, you don't need expensive hardware to use it. *PC-File* works comfortably in 512K of RAM and is one of the few databases that will fit on a 740K floppy disk: A real bonus for laptop users.

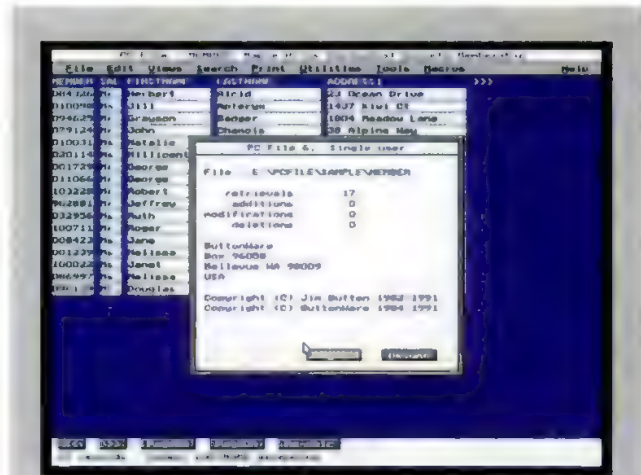
Those familiar with earlier shareware versions will have to adjust to the CUA-compliant interface, but *Windows* veterans will feel right at home. New features include a file locator, a read-only mode for viewing files, and the ability to edit multiple records on one screen.

The expanded on-line help system is mostly context-sensitive, and the documentation and fast-paced tutorial are designed for commercial distribution. If you don't feel like designing a system from scratch, the company will send you a *PC-File* Ready-To-Run application free when you register the product. You can choose from a list of 13 popular applications ranging

from a video library to purchase order invoicing.

While the trimmings look great, the code itself has some rough edges. Many of the problems are minor glitches, but first-time users will find them frustrating. We found something amiss with most of the reports. The mail-merge program failed to place a form-feed between records printing several personalized letters on one page, and form reports went awry whenever a memo field contained more than one line of text. We also found that selecting the compressed print option compresses only field data in columnar reports—headers, footers, and column headings all print in standard size.

Fortunately, ButtonWare has excellent technical support. If you call with a problem, they



From its humble shareware beginnings, *PC-File* 6.0 has matured to use a full CUA-compliant interface.

will rush you a bug fix, and they ship interim maintenance releases to registered users free.

Despite the problems, *PC-File* shows promise. Its simple, common-sense approach to data management is a boon to the cost-conscious and a relief to first-time users. In a world of databases where the sky's the

limit, here's one package that's down-to-earth.

List Price: *PC-File*, Version 6.0, \$149.95; single-user version upgrade, \$49.95; LAN upgrade, \$99.95. **Requires:** 450K RAM, DOS 3.0 or later. ButtonWare Inc., P.O. Box 96058, Bellevue, WA 98009; 206-454-0479.

CIRCLE 700 ON READER SERVICE CARD

QEMM Frees ROM Areas for TSRs

HANDS ON
by Harry Swann

If you're the type who'd kill for an extra 10K of RAM, *QEMM*-386 6.0 will make you contemplate mass murder. On a typical system, it delivers an extra 83K of UMB (upper memory block) memory (the area between 640K and 1MB) to place device drivers and TSRs.

With its automatic configuration, ability to shift between extended and EMS memory on the fly, its ability to move FILES and LASTDRIVE into high memory, and to move ROMs to fast RAM, *QEMM* 5.x was at the forefront of memory management. When DOS 5.0's optional memory manager was introduced in July, the pressure was on third-party memory managers to offer added value.

QEMM 6.0 rises to the challenge. Using a technique Quarterdeck calls Stealth technology, *QEMM* frees up address space typically used by ROM

and distinguishes itself from other memory managers.

QEMM uses one of two schemes to move the ROM. By preference, it copies ROMs to extended memory, and then uses the ROM address space for UMB memory. It then swaps the ROM to the EMS page frame when a program calls that ROM. In the rare case where this approach causes problems, it overlaps the EMS page frame over part of a ROM area.

The preferred scheme depends on two features of most ROMs. First the code should not have hard-coded addresses (like the Toshiba T5100). Secondly, access to it must only be via system interrupts that *QEMM* can monitor and adjust.

At first I was skeptical of moving ROM, but not now. Because of the way ROM works, this scheme is not likely to cause conflicts with TSRs.

The typical gain is about 83K: 64K of system ROM and 32K of VGA ROM, minus 13K

QEMM needs in the UMB region. I gained an extra 16K by relocating the SCSI ROM. PS/2 owners can gain over 140K.

I ran the PC Labs video and disk benchmark tests in three settings: without *QEMM*, with *QEMM*, and with *QEMM* with Stealth enabled. There were no significant differences on the disk access tests. The most significant test difference was in the video BIOS write without scroll test. Here, Stealth added 40 percent to the time that it took "*QEMM* without Stealth" to complete the tests; using *QEMM* with Stealth enabled was twice as speedy as not using *QEMM* at all. And since you rarely call the BIOS as often as we do in our benchmark tests, the speed decrease is well worth the memory gain.

List Price: *QEMM*-386, Version 6.0, \$99.95; upgrade, \$30. **Requires:** 386- or 486-based PC, DOS 3.0 or later. Quarterdeck Office Systems Inc., 1901 Main St., Santa Monica, CA 90405; 213-392-9851.

CIRCLE 702 ON READER SERVICE CARD

CSS:STATISTICA

CSS/3™ Complete Statistical System with over 1,000 presentation-quality graphs fully integrated with all procedures and on-screen graph customization ■ The largest selection of statistics in a single system; in-depth, comprehensive implementations of: *Exploratory techniques; multi-way tables with banners; nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; logit/probit analysis; general ANCOVA/MANCOVA; stepwise discriminant analysis; log-linear analysis; factor analysis; cluster analysis; multidimensional scaling; canonical correlation; item analysis/reliability; survival analysis; time series modeling; forecasting; lags analysis; quality control; process analysis; experimental design (with Taguchi);* and much more ■ Manuals with comprehensive introductions to each procedure and examples ■ Integrated Stats Advisor expert system ■ Extensive data management facilities (powerful spreadsheet with formulas; relational merge; data verification; flexible programming language) ■ Optimized (plain English menus/mouse) user interface: even complex analyses require just few self-explanatory selections (CSS can be run without manual. Quick Start booklet explains all basic conventions) ■ Macros, batch commands also supported ■ All output displayed in Scrollsheets™ (dynamic tables with pop-up windows and instant graphs) ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000) ■ Unlimited size of files; extended precision, unmatched speed (Assembler, C) ■ Exchanges data (and graphics) with many applications (incl. Excel®, Lotus 3®, dBASE IV®, SPSS®) ■ Highest resolution output on practically all printers (incl. HP, Postscript), plotters, recorders, typesetters ■ IBM compatibles, 640k or more ■ Price: **\$595.**

Quick CSS™ Subset of CSS/3: all basic statistical modules (incl. data management) and the full, presentation-quality graphics capabilities of CSS/3 ■ Price: **\$295.**

CSS:GRAPHICS™ A comprehensive graphics/charting system with data management ■ All graphics capabilities of CSS/3 and, in addition, extended on-screen drawing, 19 scalable fonts, special effects, icons, maps, multi-graphics management ■ Hundreds of types of graphs ■ Interactive rotation and interactive cross-sections of 3D graphs ■ Extensive selection of tools for graphical exploration of data; fitting; smoothing; spectral planes; overlaying; layered compressions; marked subsets ■ Unique multivariate (e.g., 4D) graphs ■ Facilities to custom-design new graphs and add them permanently to menu ■ Import/export of graphs and data, 15 formats ■ Optimized (menu/mouse) user interface: even complex graphs require few keystrokes: all graphs on this page can be produced from raw data in less than 20 minutes ■ Macros, batch/commands also supported ■ Unlimited size of files ■ Highest resolution output on all hardware (see CSS/3) ■ IBM compatibles, 640k or more ■ CSS GRAPHICS is included in CSS:STATISTICA (available separately for \$495).

Megafile Manager™ Comprehensive analytic data base management system ■ Unlimited size of files (up to 32,000 fields or 8 MB per record) ■ Megafile Manager is included in CSS/3 and CSS:STATISTICA (separately: **\$295**).

CSS:STATISTICA™ A fully integrated system that combines all the capabilities of CSS/3 and CSS:GRAPHICS into a single extremely comprehensive data analysis system ■ Price: **\$795.**

Domestic sh/h \$7 per product; 14-day money back guarantee



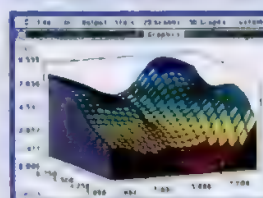
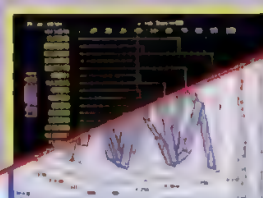
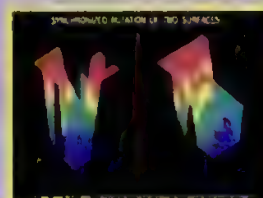
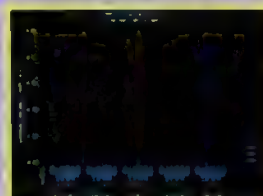
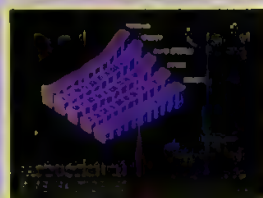
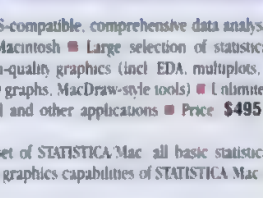
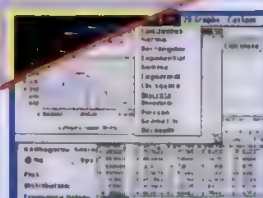
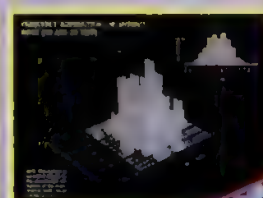
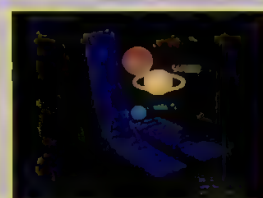
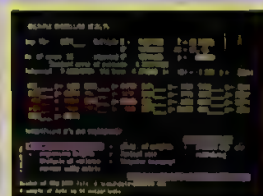
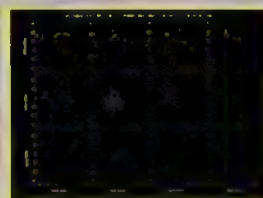
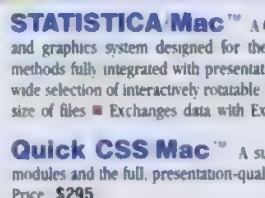
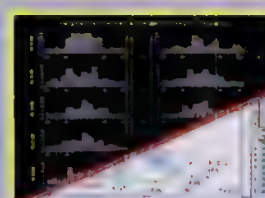
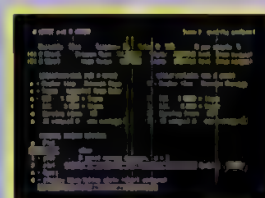
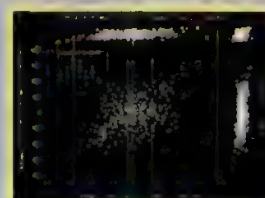
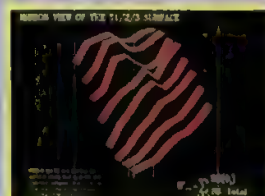
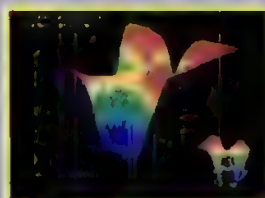
CIRCLE 485 ON READER SERVICE CARD FOR IBM
CIRCLE 496 ON READER SERVICE CARD FOR MAC

StatSoft™

2325 E. 13th St. • Tulsa, OK 74104 • (918) 583-4149
Fax: (918) 583-4376

Overseas Offices: StatSoft of Europe (Hamburg, FRG), ph 040-4200347 fax 040-4911310 StatSoft UK (London, UK), ph 0462-482822 fax 0462-482855 StatSoft Pacific (Melbourne Australia), ph 613-866-1766 fax 613-866-3318 StatSoft Canada-CCO (Ontario) ph 416-849-0737 fax 416-849-0918 Available from CORPORATE SOFTWARE and other Authorized Representatives Worldwide: Holland: Lemax BV 02065-98701, France VERSION US (1) 40590913 Sweden Akademidata 018-240035, Spain ADDLINK SRL ph 34-3-4509-0722

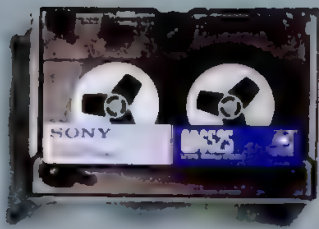
CSS, CSS/3, CSS GRAPHICS, Megafile Manager, Quick CSS, STATISTICA, StatSoft, dBase, Excel, Lotus, MacDraw, Macintosh, Postscript are trademarks of their respective companies. SPSS is a registered trademark of SPSS, Inc.



STATISTICA Mac™ A CSS-compatible, comprehensive data analysis and graphics system designed for the Macintosh ■ Large selection of statistical methods fully integrated with presentation-quality graphics (incl. EDA, multiplots, a wide selection of interactively rotatable 3D graphs, MacDraw-style tools) ■ Unlimited size of files ■ Exchanges data with Excel and other applications ■ Price **\$495.**

Quick CSS Mac™ A subset of STATISTICA Mac: all basic statistical modules and the full, presentation-quality graphics capabilities of STATISTICA Mac ■ Price: **\$295.**

BEFORE YOU CAN SAVE THE WHALES, YOU HAVE TO SAVE THE DATA.



Since man first took to the seas, life has not been easy for the endangered humpback, fin and northern right whale.

But aided by the Center for Coastal Studies, and Sony Data Cartridges, things are looking up.

Because at this pre-eminent research institute on the tip of Cape Cod, with the world's largest data base on individually identified whales, data is also a protected species. Trusted only to Sony Data Cartridges.

The whales' very survival depends on recording their entire life histories: Their world cruises. Reproductive cycles. And dining habits.

Decision makers know that lost data can endanger any operation. Not even a footnote can vanish.

A concern that leads quickly to Sony Recording Media. Our most recent developments: The 3.5" floppy disk format. The D8 (8mm) and DDS (4mm) data cartridges. Each holding a virtual sea of information.

So to ensure the survival of critical data in your operation, specify the technological leader who's making waves in data storage: Sony.

And while you're at it, call the non-profit Center at 508-487-3622 to ask how you can help save our fragile marine environments.

Any contributions are tax-deductible. And will also live forever on a Sony Data Cartridge.

CIRCLE 377 ON READER SERVICE CARD

SONY®



**ONLY
ON
SONY
RECORDING MEDIA**

First Looks

ZyINDEX Comes to Windows

HANDS ON
by Edward Mendelson

ZyLAB's \$395 ZyINDEX for Windows offers the first full-featured indexing program that lets you search and retrieve data almost instantly in the Windows environment. While the program has the power that Windows needs for effective indexing and retrieval, it lacks many conveniences that should make the job effortless.

ZyINDEX for Windows lets you index every word in up to 10 gigabytes of ordinary data files without importing or modifying the data, and it lets you retrieve text in seconds with complex Boolean, wildcard, and proximity searches. You don't get "fuzzy" searches like Magellan's, but you can search for numbers greater or less than specified figures, and a thesaurus feature lets you search for words with similar meanings.

The indexer automatically notes the first 60 characters in a file and displays them in a Comment in the list of files containing search "hits." You can also tell the program to treat defined areas in your files (like the text between "To" and "Subject") as fields in which to make narrowly defined searches. You can ask only for files that contain five or more examples of a search string. No other indexing

program gives you such precise and easy access to data.

But for all its power, ZyINDEX often feels like an unfinished product. Indexing is faster than in the classic ZyINDEX for DOS, but I still needed almost an hour to index 8MB on a 33-MHz system. (Indexes fill about half the space of the files indexed.) The program can index foreign characters, but it indexes them in Microsoft Word files, not in its other supported formats—WordPerfect, Word for Windows, Ami Pro, XyWrite, DisplayWrite, and Volkswriter. You can index files in any unsupported format, including database and spreadsheet files, but the program treats them as ASCII files.

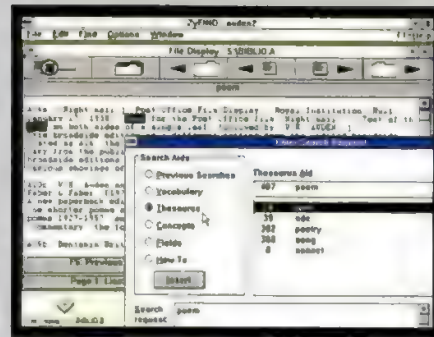
When ZyINDEX displays files that match your searches,

you can select text for copying to Windows' Clipboard, but you can't move the cursor word by word with the Ctrl-arrow keys as in all other Windows applications. You can manually view TIFF files, but you can't click on a TIFF filename embedded in a document and open the file automatically.

You'll need the manual to sort out the interface's confusing menus. For instance, one

menu lets you both delete and erase an index.

ZyINDEX locks up when indexing WordPerfect files with footnotes that extend across a page or footnotes that haven't been printed or previewed. A promised fix is free on request. Meanwhile, if you need quick access to your data and can live with its quirks, nothing gets it back faster and more flexibly than ZyINDEX for Windows. ■



ZyINDEX for Windows lets you enter searches for individual words or their synonyms; its use of MDI lets you keep more than one text file available at the same time.

ExtendBase Offers Quick Client/Server Solution for dBASE

HANDS ON
by M. Keith Thompson

Taking advantage of client-server technology often means redesigning and rewriting existing applications. Extended Sys-

tems' ExtendBase for NetWare 386 circumvents this ordeal for dBASE III+, dBASE IV, and Clipper users who are on NetWare 3.x LANs. Because ExtendBase processes your dBASE data on the file server, it

decreases response time and reduces network traffic. And at \$395 per file server, ExtendBase is a real bargain.

Although installing and customizing applications for ExtendBase is significantly easier than rewriting your applications for other database server archi-

CONTINUES ON PAGE 58



FACT FILE

ZyINDEX for Windows, Version 4.1

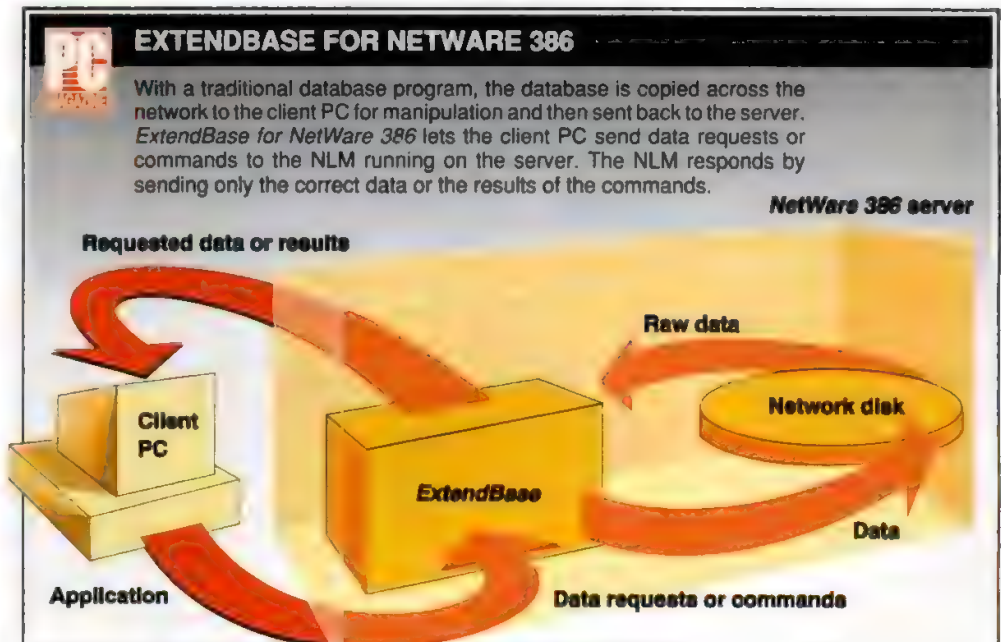
ZyLAB, 100 Lexington Dr., Buffalo Grove, IL 60089; 800-544-6339.

List Price: Single-user version or first network station, \$395; additional stations, \$195.

Requires: 1MB RAM, hard disk or access to network drive, Windows 3.0.

In Short: The only full text-retrieval program for Windows; powerful, but afflicted with bugs and design flaws.

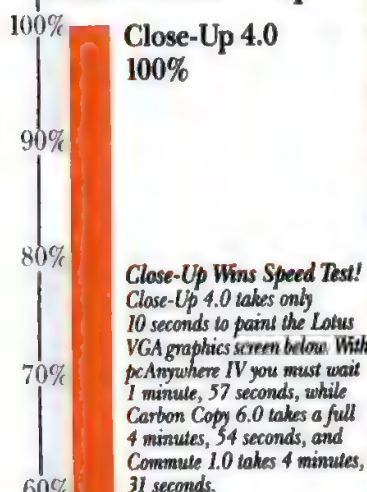
CIRCLE 402 ON READER SERVICE CARD



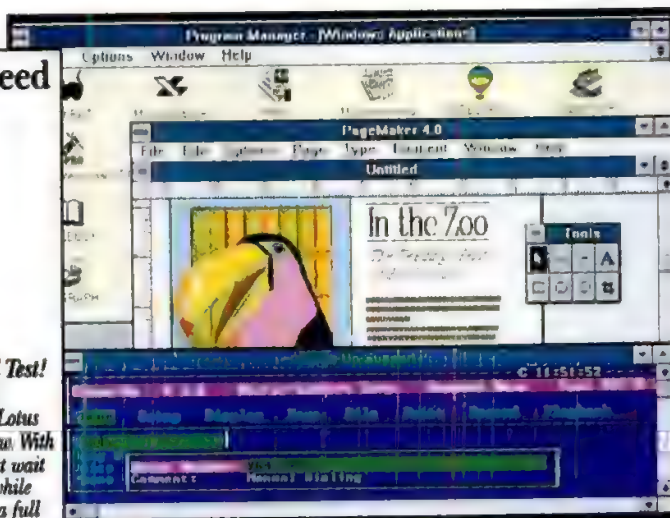
New Close-Up. the Remote with Record-Breaking Speed

Windows & DOS

Remote Screen Speed



Close-Up Wins Speed Test!
Close-Up 4.0 takes only 10 seconds to paint the Lotus VGA graphics screen below. With pcAnywhere IV you must wait 1 minute, 57 seconds, while Carbon Copy 6.0 takes a full 4 minutes, 54 seconds, and Commute 1.0 takes 4 minutes, 31 seconds.



New Close-Up lets you remotely view and operate any Windows, DOS, or graphics application on PCs all over the world.

First with Windows and Fast Graphic Speed.

New Close-Up 4.0 is the first remote technology that lets you remotely view and control any Windows[®] or DOS application on another PC miles away.

We first introduced remote communications in 1980, and developed virtually every major feature that's now the standard for remote technology.

Today Close-Up is licensed by industry leaders including 3Com, Ashton-Tate, Borland, DEC, Hewlett-Packard, IBM, Lotus, Microrim, Novell and Tektronix.

Proof that Close-Up is Fastest.

You can prove how fast new Close-Up really is: *Take the Close-Up Challenge.*

Reproduce our test[†] and see for yourself that new Close-Up 4.0 is the fastest remote program.

We took a standard VGA color graph from Lotus 1-2-3 and compared the top 3 remote programs—Close-Up, Carbon Copy, and pcAnywhere—to see how long each would take to paint a graphic screen. The results were very convincing. Read on!

In the time it takes Close-Up to paint 100% of the above Lotus VGA graph, pcAnywhere IV has painted just 8.6%, Carbon Copy 6.0 has painted just 3.4% and Commute 1.0 has painted just 3.7% of the graph.

[†]We invite you to reproduce our Remote Screen test. The graph used was a color VGA graph found in Lotus 1-2-3 Release 2.2, on the "Sample Files Disk." The file is TUTOR9X.WK1. The PCs were Everex 16 MHz 386/SXs and the modems Hayes 2400 baud Smartmodems. The baud rate was 2400.

[‡]Only Close-Up passes the Windows test. 1. Total remote keyboard and mouse support in all Windows modes: 386 Enhanced, Standard and Real. 2. Remotely run multiple Windows applications and multiple (full screen or windowed) DOS applications simultaneously. 3. Use a mouse to remotely cut & paste between windowed DOS applications and Windows applications.

No more waiting for your screens to paint! Close-Up lets you work faster, more productively with the fastest screen refresh, interaction and response time ever seen!

To paint the Lotus graphic pcAnywhere IV took 1 minute, 57 seconds. Almost 2 minutes. That's like having to sit through four TV commercials.

Carbon Copy 6.0 took a full 4 minutes, 54 seconds. Almost 5 minutes. That's like waiting through five traffic lights.

How fast did Close-Up paint it? The results will astound you. 10 seconds.

That's right. 10 seconds is all Close-Up took to paint the screen and let you continue working.

Call for FREE Working Model

Take the Close-Up Challenge.

Try it for yourself. If you're not absolutely convinced that Close-Up 4.0 is the fastest remote program, we'll give you your money back.*

Risk-Free Introductory Offer!

Now for a limited time you can get your new Close-Up 4.0 Dual Pack, including both sides, Customer/Terminal & Support/ACS, for only \$199. That's a savings of over \$240 and includes our Risk-Free, 30-Day Money-Back Guarantee!*

Convert Now!

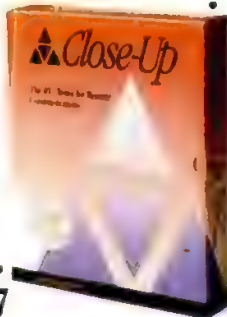
Convert your current remote program to new Close-Up 4.0, the fastest remote around. Get Customer/Terminal or Support/ACS for only \$49 each!*

Call 805-964-6767

Norton-Lambert

Bringing People Together[®]

P.O. Box 4085, Santa Barbara, CA 93140 USA
Phone 805-964-6767 FAX 805-683-5679



*30-Day Money-Back Guarantee if purchased directly from Norton-Lambert. Offer expires 10/31/91. Offer limited to one per customer. All prices in US Dollars. Prices exclude shipping. ©1991, Norton-Lambert Corp.

CIRCLE 750 ON READER SERVICE CARD

First Looks

ExtendBase

CONTINUED FROM PAGE 56

tures, there are certain *ExtendBase* requirements. Data must be stored on the file server, you must use one of three different *ExtendBase* front ends to access the data, and applications written in the *dBASE* language need to be recompiled using *Clipper* and *ExtendBase*. You can gain interactive access to raw *dBASE* data without recompiling, however.

The *ExtendBase* package has four distinct components. The Indexer Plus NLM runs on the *NetWare 3.x* file server and provides services to the three front-end client PC programs. The front ends are: an *xBASE* interface, an *ExtendBase Data-*

lens driver, and an *ExtendBase Query Processor*. Both the Indexer and the *xBASE* interface are included in the base price; the *Datalens* and *Query Processor* are available for \$95 each.

The *xBASE* interface gives experienced users access to their data from the familiar *dBASE* dot prompt. The *ExtendBase Datalens* driver functions like the *Lotus 1-2-3 Datalens* driver, allowing 1-2-3 users to bring data directly from databases on a *NetWare* file server into their spreadsheet. The *ExtendBase Query Processor* is a simple menu-driven program allowing users easy access to databases stored on the server.

The *xBASE* interface has two utilities. The USE interpreter accepts *dBASE*-compatible commands from the dot prompt. The *Clipper* programming interface lets developers seam-

lessly access the Indexer Plus NLM from within *Clipper* programs. Just add the line `#include "indexplus.ch"` in your *Clipper* source file and change all references to COPY, INDEX, and REINDEX to NCOPY, NINDEX, and NREINDEX. These commands instruct the Indexer Plus NLM, running on the server, to do the work there instead of sending the whole database to the client PC. *ExtendBase* also supports *Clipper* NTX file indexes.

Because *ExtendBase* uses the file server to do its information processing, the performance improvements will be affected by the type of CPUs in your client and file server PCs. In our tests, we used a 20-MHz 386SX with 8MB of RAM for a *NetWare 3.11* server and a 10-MHz 286 as our client PC.

The results were impressive.

dBASE indexed a 10,000 record, 1MB database on 2 fields in 1 minute and 42 seconds; *ExtendBase* did it in 16.4 seconds. Using the LIST command, *dBASE* searched through and displayed 300 records in 1 minute and 31 seconds; *ExtendBase* managed it in 30.4 seconds.

Overall, *ExtendBase* brings excellent performance benefits to *dBASE*-compatible file users on a *NetWare 386* network, especially on multimegabyte data files.

List Price: *ExtendBase* for *NetWare 386*, \$395; *Query Processor*, *Lotus 1-2-3 Datalens*, and *xBASE* front ends, \$95 each. **Requires:** For server: 200K RAM, *NetWare 386*. For client PC: 512K RAM, DOS 3.x or later. Extended Systems, 6123 N. Meeker Ave., Boise, ID 83704; 208-322-7575.

CIRCLE 448 ON READER SERVICE CARD

VideoLogic Mediator: Plug and Play VGA to NTSC Video

HANDS ON
by Steve Rosenthal

The VideoLogic Mediator is a desktop unit about the size of a thick notebook that changes standard VGA or Macintosh video into NTSC-style video with a minimum of fuss and adjustment. Although far short of broadcast quality, the results are good enough for most internal corporate applications.

Of course, users who regularly produce video presentations or training materials might prefer to use an internal videographics video adapter (such as

TrueVision's TARGA series) that produces NTSC-style output within the PC. But the Mediator's flexible external design and quick setup means that anyone can bring this box over to his or her desktop or portable PC, plug in a few cables, and be video-compatible in minutes.

Internally, the Mediator is a full electronic scan converter that digitizes the incoming analog video signal, adjusts the picture timing digitally, and converts the output back to analog NTSC format. But unless you're going to synchronize the output with another video

source, the beauty of the Mediator is that you don't have to know anything about how it works or what's inside.

To use the Mediator, you plug a VGA (or Mac) cable from your normal video output to a connector on the back of the unit. If you normally use a separate monitor, you connect its cable to a pass-through connector. The Mediator automatically recognizes and converts 640-by-480 VGA images to video in $1/30$ of a second (real time). The NTSC-style video is available both in standard composite and the S-video (separated video) format that keeps color and brightness on different wires.

There is no software, but for optimal results you can set several options with Mediator's five push buttons and the two-line front panel display. Options include overscan or underscan (full-screen picture or with borders), some limited flicker filtering, sharpness, centering, and even gamma (brightness) correction for improved contrast with some projection panels.

If you're going to overlay the video or route it through a switching or editing system, you'll also have to adjust the timing. The Mediator includes a sync input for genlocking the output to external timing, and

there is even a tweak control on the back for adjusting the phase of the timing.

Most corporate users will be pleased with the Mediator. Within the limits of NTSC's interlaced format—which naturally has a lot more flicker and limited resolution than does VGA video—you get a fairly attractive picture. A standard composite monitor will show more color interference than you get with a computer-grade S-video model such as Sony's multimedia GVM series, but if you pick moderate colors you'll be okay in either format.

Given the Mediator's \$2,995 price, a single user will be better off with an internal videographics card. But if you run a combination of machines (desktop PCs, portables, or Macintoshes) or if you just don't have the time or inclination to constantly pop video boards in and out, you'll appreciate the Mediator's convenience.

List Price: VideoLogic Mediator, \$2,995. **Requires:** PC or Macintosh with VGA or standard Mac video output, NTSC (television-style) monitor or video recorder. VideoLogic Corp., 245 First St., Cambridge, MA 02142; 617-494-0530.

CIRCLE 430 ON READER SERVICE CARD

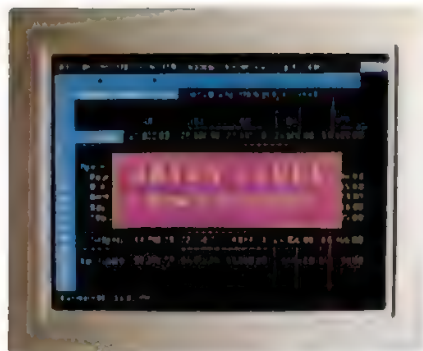
No software, no add-in boards, VideoLogic's Mediator is a no-fuss way to turn VGA graphics into NTSC video.



PHOTOGRAPHY: RICK BECKER



Ambulance Car Virus. Ambulance randomly moves across bottom of display.



Friday 13th Virus. Alias "Black Friday." Erases programs when you try to run them.



Disk Killer Virus. Alias "Ogre." Causes unexpected formatting of your hard disk.



Stoned Virus. Alias "Hawaii." Data loss caused by damage to directory and FAT.



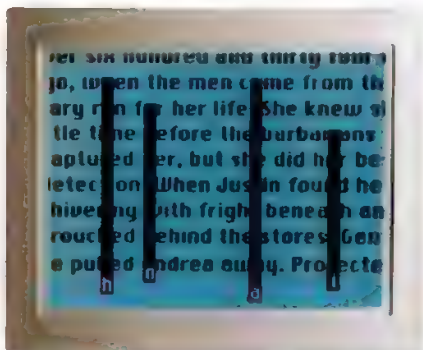
Datacrime Virus. Adds garbage to files and reformats disk.



AirCop Virus. Alias "Red State." Attacks boot sector on non-write-protected diskettes.



Ping Pong Virus. Alias "Bouncing Ball." Wipes characters off the screen.



Falling Letters Virus. Characters fall to the bottom of the monitor. Creative, but a real nuisance.



With over 50 new viruses each month, who knows what's next.

You Could Get By Without An Anti-Virus Program. Then Again, So Could These.

These days, with networks, modems, laptops, and more and more people sharing files, it's only a matter of time before a virus attacks your data.

To make sure you get them before they get you, you need Central Point Anti-Virus.™ The only anti-virus program with File Immunization that protects your files so they can never be infected again.

Central Point Anti-Virus detects over 800 viruses and destroys twice as many viruses as other programs. It'll even protect you from unknown viruses by searching for suspicious behavior.

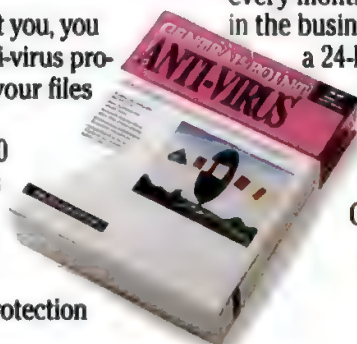
It's also the best anti-virus program for protection

inside Windows, and it works great across your Novell network.

And since there are about 50 new viruses popping up every month, we give you the most comprehensive support in the business. Including a free update, quarterly mailings, a 24-hour hotline with FaxBack, and BBS and CompuServe support forums.

If you want the most complete virus protection, there are really only two things you can do. Call 1-800-445-4076 for more information. Or unplug your computer.

Central Point Software INC.
Making Computing Safer, Simpler, Faster.



New Kodak
Diconix
180si printer

The Kodak Diconix 180si printer, new from the innovator in portable printers. It's more printer than ever, with more value than ever, but even less weight than ever.

It's the latest in portable printers from the people who started it all! The new DOS-Compatible Kodak Diconix 180si printer is even easier-to-use, and offers still more fonts...yet actually weighs less. And you get all the features that made Diconix printers what they are today, including both tractor feed and single sheet paper handling, plus the silent reliability of ink jet technology. All in a footprint that's smaller than a sheet of paper!

And now the value is greater than ever: with a suggested list price of only \$399*(U.S.) for the complete package, the 180si printer is a sensational buy! For more information and the name of a dealer near you in the U.S. and Canada, call 1 800 344-0006.

*Manufacturer's suggested list price. Dealer prices may vary.

**NOW, THE PORTABLE
PRINTER WITH THE
ONE THING YOU WANT:
EVERYTHING.**

KODAK

New Kodak Diconix 180si printer



CIRCLE 196 ON READER SERVICE CARD

by
Nate Zelnick

New & Improved

News of Announced Products and Upgrades

NEC's Next-Generation Monitors Include Front-Panel Color Control

NEW NEC Technologies has released its newest series of multiscanning monitors offering NEC's AccuColor color-control system. This system allows you to customize color settings by adjusting the red, green, and blue color guns separately from a digital control on the front panel. In addition to the factory setting, you can program two other settings. AccuColor permits correlation between screen image and output and allows for individual color preference.

The FG series comes in three models: the NEC MultiSync 4FG, 5FG, and 6FG, which have 15-, 17-, and 21-inch screens, respectively. Each is a polished, flat-screen monitor with a 0.28-mm. dot pitch, and conforms to the 1991 SWEDAC (MNP II) standards for VLF and ELF emissions.



NEC's FG series have independent controls for the red, green, and blue guns.

The FG series supports VGA, extended VGA, Super VGA, 8514/A, XGA, 1,024-by-768, and 1,280-by-1,024 resolutions. **List Price:** NEC MultiSync 4FG, \$899; NEC MultiSync 5FG, \$1,599; NEC MultiSync 6FG, \$3,499. **Requires:** Video adapter. NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 508-264-8000.

CIRCLE 436 ON READER SERVICE CARD

HOT PROSPECT

ACER 256-SHADE GRAY-SCALE LASER PRINTER: NO DITHERING

Acer Peripherals, a division of Acer, is now offering the industry's first true gray-scaling laser printer. The \$1,995 6-page-per-minute AcerLaser IIIG uses a proprietary hardware/software combination, which the company has dubbed AcerGray, to achieve 256-shade gray-scaled images without visible dots or dithering.

AcerGray uses anti-aliasing to print 4,800 partial dots per inch instead of the standard 300. The partial dots are biased toward a particular space—either left, right, or center—to create the gray scale.

Current IIIG drivers that support gray-scale printing include *Microsoft Windows*, *PageMaker*, *Publisher's Paintbrush*, and *WordPerfect*. Programs that are not supported can print to a file. A DOS utility included with the printer prints from a DOS session; resizes, crops, and scales images; adjusts dots per inch and gray-scale levels; and controls contrast levels.

The AcerLaser IIIG emulates the Diablo 630, Epson FX-80, HP LaserJet II and IIP, and IBM Proprinter, as well as HPGL printers; it comes with 78 bitmapped fonts. Optional PostScript Level 1 and PCL 5 cartridges are available. PostScript emulations print in resolutions up to 600 dpi, and they use Acer's proprietary anti-aliasing technology to smooth curves.

List Price: AcerLaser IIIG, \$1,995. Acer Inc., Peripherals and ASIC Business Unit, 101 Business Park Dr., #100, Skillman, NJ 08558; 609-924-1153.



The AcerLaser IIIG uses an anti-aliasing technique to increase resolution and print gray-scale images.

CIRCLE 435 ON READER SERVICE CARD

GeoWorks Ensemble Adds Features; Uses DOS 5.0's Task List

IMPROVED GeoWorks Ensemble, GeoWorks' integrated application environment, can now be switched as a task from DOS 5.0's task list; users no longer need to exit the program to run DOS tasks. GeoWorks will add an integrated task switcher in Version 2.0.

Other new features in Version 1.2 are a 100,000-word spell-checking dictionary, support for networks (including Artisoft's LANtastic and Novell's NetWare), and support for Adobe PostScript printing. A version of the popular game *Tetris* is also now included.



GeoWorks Ensemble now has spell-checking and connects to network drives.

List Price: GeoWorks Ensemble, \$199. **Requires:** 512K RAM, hard disk, DOS 3.0 or later. GeoWorks Inc., 2150 Shattuck Ave., Berkeley, CA 94704; 800-772-0001, 415-644-0883.

CIRCLE 437 ON READER SERVICE CARD

Nikon Revs Speed, Adds Color Correction To Scanner

IMPROVED Nikon Electronic Imaging claims to have increased the scanning speed of its LS-3500 slide scanner (see First Looks, September 10, 1991). The new model, the Nikon LS-3510AF, can complete an 8MB scan (2,048 by 1,635 pixels) in under 90 seconds with auto-focus and color correction enabled, according to Nikon.

The new model also offers an optional

CONTINUES ON PAGE 62

BRIEFS



DRIVES

Microbank Software has announced *StoreFiche* (\$16,900), an optical storage system designed to emulate a microfiche library. The system currently runs on *NetWare* and *Pathworks* networks and can access up to 75 gigabytes of information stored in jukeboxed WORM optical drives. 212-363-5600.

Maynard Electronics has introduced the first 5GB 8-mm. helical-scan tape backup system. The *MaynStream 5000* (\$9,495) offers a throughput of 30MB per minute, according to the company. The system is bundled with Version 3.1 of Maynard's *MaynStream* backup software. 800-821-8782, 407-263-3500.

Tass Optical World is shipping its \$2,495 3.5 MF (multifunction) optical drives. The drives support either WORM (write once, read many) or rewritable 3.5-inch disks. The 3.5 MF accepts 128MB disks and has a reported access time of 28 milliseconds. Tass has also introduced a 5.25 optical disk changer (\$7,500) with a 5GB storage capacity when switching five 1GB disks (\$250 each). The 5.25 LS has a 32-ms. changer speed and embedded SCSI, ANSI, and ISO compliance. 619-558-8882.



REMOTE ACCESS

Softklone has released Version 2.0 of *Takeover* (\$295), its combination communication, remote-access, and remote-control software. The new version adds remote mouse support for DOS applications, faster graphics scaling on the guest machine, voice/data switching on a single phone line, and data compression from the guest. *Takeover* includes guest and host software, as well as *Mirror III*, Softklone's communications package. Softklone has also announced *Takeover Lite* (\$179), which includes only the guest and host software. 904-878-8564.

IDR Unicom is shipping Version 5.30 of *Via PC* (\$295; upgrades, \$95). The integrated front end for fax and modem transmission can now send files from within applications transparently. It includes support for Intel's SatisFAXtion and Macronix's Max Fax boards, and a

CONTINUES ON PAGE 64

CONTINUED FROM PAGE 61

color-correction table that allows the scanner to pick from a palette of 68 billion colors. The auto-focus feature automatically picks the sharpest focus possible. The new model also supports a wider range of films, a 40-mm. by 40-mm. maximum scanning area, and 5,000-by-5,000-pixel scanning resolution.

The LS-3510AF offers a SCSI interface in addition to the standard GPIB. *PhotoStyler*, which Aldus Corp. recently purchased from U-Lead, is still bundled with the system. **List Price:** Nikon LS-3510AF, \$8,995. 12-bit-color option, \$1,430. **Requires:** 386-based PC or better, 2MB RAM, *Microsoft Windows* 3.0. Nikon Electronic Imaging, 1300 Walt Whitman Rd., Melville, NY 11530; 516-547-4200.

CIRCLE 438 ON READER SERVICE CARD

Aquiline's 386/33DX Notebook Ships

NEW Aquiline has shipped the first true notebook computer using a 33-MHz 386 processor. A fan placed over the processor sucks air through a vent above the keyboard to cool the system.

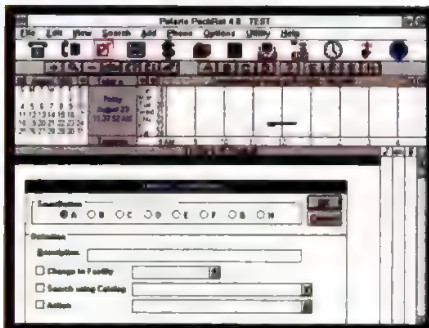
The unit, which weighs 8 pounds including its battery pack, comes with 4MB of RAM (upgradable to 16MB), a 1.44MB internal floppy disk drive, a backlit 32-gray-scale 640-by-480 VGA LCD screen, and an 83-key keyboard. Options include a 60MB or 120MB Conner hard disk, 32K or 128K cache, and an AT-bus docking station.

List Price: Aquiline NT33, with 60MB hard disk, \$3,695; with 120MB hard disk, \$3,995. Aquiline Inc., 449 Main St., Bennington, VT 05201; 802-442-1526.

CIRCLE 440 ON READER SERVICE CARD

PackRat Adds Shortcuts to Windows PIM

IMPROVED Version 4.0 of **Polaris Software's PackRat** adds predefined and user-definable macro routines to aid in navigating the *Microsoft Windows* 3.0 PIM (personal



PackRat's customizable buttons let you automate your most frequent PIM tasks.

information manager). The seven "action buttons" skip through some of the most common *PackRat* activities, while the eight "smart buttons" can capture your most common keystrokes and play them back later.

DDE links to other *Windows* products now offer quick faxing through Delrina's *Winfax Pro*, mail-merge with Lotus's *Ami Pro* or *Microsoft's Word for Windows*, and automatic integration with *Microsoft Excel* and the expense manager. Other major enhancements to this release include an omnipresent to-do list, an integrated contact list, and more scheduling options.

List Price: *PackRat*, Version 4.0, \$395; upgrade from previous versions, \$49.95. **Requires:** *Microsoft Windows* 3.0. Polaris Software, 1820 S. Escondido Blvd., #102, Escondido, CA 92025; 619-743-7800.

CIRCLE 441 ON READER SERVICE CARD

Full-Page Monitor Tilts for Portrait Viewing

NEW Radius has introduced the Full Page Pivot and Super VGA MultiView interface card, which, together, form its full-page viewing system. The Super VGA monitor pivots 90 degrees on its stand to provide full screens in both horizontal and vertical positions, allowing you to view an entire word processing or desktop pub-



The Full Page Pivot, from Radius, turns 90 degrees on its stand for both portrait and landscape viewing.

lishing page at once.

The 15-inch low-radiation monitor has a flat tube and is capable of resolutions up to 1,024 by 768 pixels with 256 colors.

A Sierra RAMDAC (random access memory digital-to-analog converter) allows for the simultaneous display of 32,768 colors at 640-by-480 resolution. The pivot function requires Radius' MultiView graphics adapter.

List Price: Full Page Pivot, \$1,249; MultiView adapter, \$499. **Requires:** Open AT slot. Radius Inc., 1710 Fortune Dr., San Jose, CA 95131; 408-434-1010.

CIRCLE 443 ON READER SERVICE CARD



Borland's Turbo Pascal for Windows What you need to go the distance

Turbo Pascal® for Windows is the easy way to get into Windows application development and go as far as you want. Because Turbo Pascal for Windows gives you *twice*

	Visual Basic	Turbo Pascal for Windows
Visual interface editing	Yes	Yes
Object-oriented language	No	Yes
Compiled	No	Yes
Built-in assembler	No	Yes
Extensible	No ⁽¹⁾	Yes
Create DLLs	No	Yes
Reference to API	No	Yes
Resource compiler	No	Yes
Help compiler	No	Yes
Speed (Sieve)	20.21 sec.	1.65 sec.
Space (Sieve)	5429 bytes ⁽²⁾	1156 bytes

⁽¹⁾Visual Basic can only be extended by writing Dynamic Link Libraries in C, C++ or Pascal.

⁽²⁾Visual Basic requires a runtime Dynamic Link Library of 272K.

Turbo Pascal for Windows comes with everything you could possibly want for writing Windows applications easily.

the features of Visual Basic in a faster, more efficient package. So you'll never run out of horsepower!

With Turbo Pascal for Windows you can instantly create a functional Windows interface *without programming*, using the included Resource Toolkit. And you can write your first Windows program in just *five* lines of code.

The objects of Windows development

Turbo Pascal for Windows comes with a complete library of prewritten program building blocks called objects. To create a program, simply select the objects you want from the included ObjectWindows™ library, place them in your application, and off you go. Before you know it, you've created your first Windows program complete with overlapping Windows, pull-down menus and dialog boxes!

Get the critics' choice!

Turbo Pascal for Windows goes the distance with the critics, too! David Gerrold in *PC Techniques* (July–August 1991) says, "If I had to pick one killer 'app' for Windows, I'd pick Turbo Pascal for Windows." *Windows and OS/2 Magazine* states, "The speed of the compiler is a pleasure to experience." (Sept. 1991). *InfoWorld* proclaims, "Turbo Pascal sets the standard for Windows programming. The ObjectWindows library makes (it) extremely easy to use." (June 3, 1991).

Now you can get Turbo Pascal for Windows for only \$99⁹⁵ from Borland (after a \$25 manufacturer's rebate*). That's \$150 off the suggested retail price and half

\$99⁹⁵
Limited Time Offer

REPORT CARD

INFO WORLD

Turbo Pascal for Windows

VERSION 1.0

Criterion	Score
Performance	
Programming environment	Excellent
Language extensions	Excellent
Debugging	Excellent
OOP implementation	Excellent
Documentation	
Ease of learning	Very Good
Ease of use	Excellent
Error handling	Very Good
Support	
Support policies	Very Good
Technical support	Very Good
Value	
Value	Excellent
Final score	9.1

Turbo Pascal for Windows received one of the highest scores ever in InfoWorld, outperforming Visual Basic.

the price of Visual Basic!† So why limit your Windows development when you can go as far as you want? Turbo Pascal for Windows. The easy way to go the distance. See your dealer today, or call 1-800-331-0877 now!

BORLAND

The Leader in Object-Oriented Programming

CODE: MF32

*Offer good until December 31, 1991 †Rebate also available from your local dealer. Dealer prices may vary. Copyright © 1991 Borland International, Inc. All rights reserved. Turbo Pascal and ObjectWindows are trademarks of Borland International, Inc. 811432

CIRCLE 287 ON READER SERVICE CARD

BRIEFS

CONTINUED FROM PAGE 62

foreground alert for notifying the recipient while polling in the background. 215-825-8181.

Triton Technologies has released an update of *Co/Session* (\$195). Version 6.0 lets you connect to and control a remote PC running *Microsoft Windows*. The product runs quickly under *Windows* through the use of a proprietary graphics technique. 908-855-9440.



WORD PROCESSING

Perfect Software is offering *Perfect Key* (\$69.95), a task automation utility for *WordPerfect 5.0* and 5.1. The product offers users an alternate function-key layout that groups tasks under single keys. All delete functions, for example, are grouped under F8, all block functions under F5, and so on. The product also includes automated style templates and extensive help screens. Modified key templates are included in the package. 313-647-8161.

Keep It Simple Software is also shipping a *WordPerfect* automation package. *Perfect Kiss for WordPerfect* (\$69), which also incorporates a task switcher, creates a pull-down menu option and hotkey that pop an active menu of the 40-function template on the screen. The template lets users pick menu choices with the mouse or with a single keystroke. (To print, for instance, you hit P.) *Perfect Kiss* supports *WordPerfect 4.2*, 5.0, and 5.1. 203-375-0914.

Quicksoft is shipping *PC-Write Standard Level* (\$129; upgrade \$99). The product adds a new interface to the word processor including pull-down menus, mouse support, context-sensitive help, and import/export support for *WordPerfect*, ASCII, and DCA/RFT formats. An "adapt" feature lets users modify menu choices as needed. 206-282-0452



UTILITIES

The Software Factory has updated its program installation utility, *EZ-Install* (\$249). Version 4.0 of the product offers automated modification of *Windows* initialization (.INI) files, integration of the EZARC

CONTINUES ON PAGE 66

Windows-Specific Printer Speeds Output

IMPROVED Addressing one of the loudest complaints from *Windows* users, **LaserMaster** has released a printer designed to run in that environment. The WinPrinter skips the biggest bottleneck, the Print Manager, and sends image data to a DOS virtual machine. Using the true preemptive multitasking capabilities of a 386 processor, the printer's driver can image a page in the background, freeing *Windows* for other tasks.

On a 386SX, LaserMaster claims it prints 3 times as fast as *Windows* Print Manager. Because all work is done on the processor, print speed increases with processor speed.

The 4-ppm printer offers 300- or 400-dpi output and 50 Type 1 fonts, and it has emulations for both Adobe PostScript and PCL 4. **List Price:** WinPrinter, \$1,995. **Requires:** 386SX PC or better, 4MB RAM, open adapter slot, *Windows 3.0*. LaserMaster Corp., 6900 Shady Oak Rd., Eden Prairie, MN 55344; 800-327-8946, 612-943-8286.

CIRCLE 442 ON READER SERVICE CARD

Superbase 4 Adds Network File Lock Links to SQL

NEW *Superbase 4 Windows*, from **Software Publishing Corp.**'s Precision Software Subsidiary, has added file locking and an embedded SQL (structured query language) extension to the database management language. An additional program, *Superbase SQL Library*, allows *Superbase 4 Windows* to connect concurrently with multiple databases and database servers.

Other changes for Version 1.3 include revised algorithms (yielding, according to the company, a 25 percent speed improvement in record and sequential-file retrieval, execution of DML commands, and variable assignment and identification routines), plus query optimization, support for .DIB (device-independent bitmap), .GIF, and .TGA graphics file formats, and an easier application development process.

Superbase SQL Library connects to a wide variety of servers, including: *Microsoft's SQL Server* on OS/2, *SyBase* for Unix and VMS, *Gupta's SQLBase*, *Oracle Server* for OS/2 and other platforms via SQL*Net, and DB2 for MVS/XA and ESA via EE DM.

List Price: *Superbase 4 Windows*, Version 1.3, \$695; *Superbase SQL Library*, \$495.

Requires: For *Superbase 4 Windows*: *Windows 3.0* or later; for *Superbase SQL Library*: *Superbase 4 Windows 1.3* or later. Precision Software Publishing Corp., 8404 Sterling St., Irving TX 75063; 214-929-4888.

CIRCLE 444 ON READER SERVICE CARD

Class 1 Fax/Voice/Modem

IMPROVED Dove Computer Corp., a maker of Mac modems, hopes to bring the phone-mail capabilities of its 9,600-/2,400-bps Class 1 fax/voice/modems to the PC with its first introduction of a PC product. The voice capability built into the DoveFax's hardware uses two DSPs (digital signal processors) for voice messaging. While the current implementation of the software does not support it as yet, Dove plans to introduce the voice-messaging drivers in early 1992.

The DoveFax is offered in two configurations. The DoveFax for DOS incorporates an OEM version of MagicSoft's *MTEZ*; the DoveFax for *Windows* is bundled with a version of Alien Computing's *FAXit for Windows*, modified with built-in on-line help from Dove's bulletin board system.

List Price: DoveFax for DOS, \$349; DoveFax for *Windows*, \$399. **Requires:** For DOS version: 640K RAM, DOS 3.1 or later; for *Windows* version: 3MB RAM, *Microsoft Windows 3.0*. Dove Computer Corp., 1200 N. 23rd St., Wilmington, NC 28405; 800-788-3683, 919-343-5600.

CIRCLE 445 ON READER SERVICE CARD

Printer Controllers Increase LaserJet Resolutions

NEW DP-Tek is now offering a proprietary interface that doubles the resolution of HP LaserJets and other 300-dpi Canon SX or LX engine-based printers. The interface is capable of 600 dots per inch and can print camera-ready screens and halftones. In addition to the resolution enhancement, called TrueRes, the TruePoint controller uses an on-board 16-MHz Intel 80960 RISC (reduced instruction-set computing) processor, a RAM cache, and built-in data compression to increase throughput.

The controller offers a font management utility and an Adobe PostScript interpreter, which supports PostScript Level 2, built into ROM. The TruePoint comes with 35 PostScript-compatible typefaces and can support additional Type 1 or Type 3 PostScript-compatible faces. The TruePoint supports existing printer drivers for HP LaserJets and compatibles.

Pacific Semiconductor's Argon-8 turns your old HP LaserJet Series II into an HP LaserJet III printer. Based on a 20-MHz Motorola 68020 processor, the controller boasts scalable fonts, built-in serial printer sharing, 2MB of RAM (upgradable to 16MB), portrait and landscape printing, and speed gains up to ten times that of the HP LaserJet III, according to the vendor.

CONTINUES ON PAGE 66



Borland's Paradox. Grasp the power of the new standard

Paradox® is now the recognized standard against which all other databases are measured. A database that is as powerful as it is easy to use.



That's why Paradox has won virtually every database award since its introduction. Including Best Programmable Database for both single-user and multiuser environments (*InfoWorld*, November 1990), the #1 SQL Front End (*NSTL*, February 1991) and Editors' Choice (*PC Magazine*, May 1991). Now you can grasp all of the power that Paradox offers.

Power Without Pain

Paradox's legendary combination of power and ease-of-use has made it the standard for applications developers and users alike. Paradox comes with a full-blown development language, PAL™, for building custom database applications. Plus features such as Query By Example,

multi-table forms and reports, and presentation-quality graphics that make Paradox the #1 choice of database users.

Extend Your Reach! Paradox Engine and Paradox SQL Link

Paradox® Engine provides C, C++ and Pascal programmers with an Application Programming Interface (API), so your programs can access Paradox data in both single-user and multiuser environments. And with Paradox® SQL Link users can access remote data stored in SQL servers.*

dBASE† Owners! Grasp Paradox RISK FREE for only \$175

If you own any version of dBASE®, you can upgrade to Paradox 3.5 for only \$175. That's a substantial savings off of the \$795 list price. And you get a 60-day, money-back guarantee. Risk Free. Paradox even reads and writes dBASE files for integration into your existing environment. Order today. See your dealer or call now at 1-800-331-0877.

B O R L A N D

Software Craftsmanship

CIRCLE 285 ON READER SERVICE CARD

CODE: MK38

*Microsoft, SYBASE, IBM, Oracle and DEC Rdb/VMS servers supported now. Paradox SQL Link (\$495 list price, sold separately) and Paradox 3.5 are required to make the connection with SQL servers. Paradox Engine is sold separately. †Offer also valid for owners of R. BASE, DataEase and FoxPro. Upgrade offer expires 11/30/91. Pricing is in U.S. dollars. Offer good in U.S. and Canada only. Copyright © 1991 Borland. BI 1412

New & Improved

BRIEFS

CONTINUED FROM PAGE 64

decompression routine, dynamic alteration of start-up batch files, network detection, and unlimited subdirectory creation. 214-490-0835.

Micro-Z Co. has released *Del-Elite* (\$89.95), a DOS-based disk-management utility that lets you see your disk in a "tree" mode with a bar chart listing usage percentages for different files. *Del-Elite* allows you to see your file-usage patterns over time. Files accessed infrequently can be archived on the fly to free up more space on your hard disk. 800-755-3553, 213-377-1640.

Microsystems Software is shipping *MAGic* (\$79), a VGA magnification utility that doubles screen sizes in both DOS and Windows. The 8K program supports VGA, XGA, and SVGA modes and will enlarge text and graphics screens on PCs and laptops. A demo copy is available on the MSI bulletin board (508-875-8009). *MAGic* incorporates type-through access, cursor and mouse following, and attribute tracking in double-screen mode. 508-626-8511.



DATABASES

Bytel has updated its template-driven *dBASE* application generator, *Genefer* (\$395). Version 3.0 adds a DOS-based CUA interface including pull-down menus, pop-up windows, browse lists, and dialog boxes. Other new features include direct indexing from the data dictionary, improved error checking, global automatic updating, and a displayless code-generation option for multitasking systems. 800-777-0126, 415-527-1157.



POWER MANAGEMENT

Falcon Electric has released a line of UPSs (\$1,090–\$1,790) designed to ensure power levels during brownouts. The power-conditioning device is designed to provide a perfect sine at all times. 818-287-6116.

Proxima Corp. is shipping its Power-Touch (\$109.95) power protection and control device. The power strip is designed to sit between your PC and monitor, and it offers complete power control of PCs and peripherals from the front panel. 619-457-5500.

CONTINUED FROM PAGE 64

The eight resident fonts can be scaled from 1 to 999 points. The controller mimics an HP LaserJet III with PCL 5, and it emulates the HP 7475A Plotter. An optional IBM 3270 main-frame connector is also available.

List Price: TruePoint, \$1,695. **Requires:** Canon SX-based laser printer. DP-Tek, 9920 E. Harry, Wichita, KS 67207; 316-687-3000.

CIRCLE 705 ON READER SERVICE CARD

List Price: Argon-8, \$999. **Requires:** Canon SX-based laser printer. Pacific Semiconductor, 90 Montclair Ave., Montclair, NJ 07042; 201-746-5848.

CIRCLE 448 ON READER SERVICE CARD

Database Reporting For Desktop Publishing

NEW **Ventura Software**, maker of *Ventura Publisher*, has released *Ventura Database Publisher*, a database reporting program that simplifies links between databases and desktop publishing systems. The program extracts, tags, and sorts information in .DBF or ASCII format and passes the data to *Interleaf*, *PageMaker*, or *Ventura Publisher*.

The product comes in DOS/GEM and Windows editions. A batch language called Recipe allows you to automate repetitive procedures. A map of up to eight icons provides a simple point-and-click map of sorting and extracting procedures.

List Price: *Ventura Database Publisher*, \$695. **Requires:** For DOS/GEM version: 286-based PC or better, 640K RAM, DOS 3.2 or later, *Ventura Publisher* 2.0 or later or *PageMaker* 2.0 or later. For Windows version: *Microsoft Windows* 3.0 or later, *Ventura Publisher* 2.0 or later or *PageMaker* 3.1 or later. Ventura Software Inc., 15175 Innovation Dr., San Diego, CA 92128; 800-822-8221, 619-673-0172.

CIRCLE 447 ON READER SERVICE CARD

Build a PC-based MIDI Workstation

NEW **Turtle Beach Systems** is shipping two new entries in its line of PCs optimized for MIDI-standard audio processing. Designed to be hooked to a DAT (digital audio tape) machine, these systems use Turtle Beach's 56K digital system, which is composed of an interface card, a digital interface box, and Version 1.2 of the audio-editing software *SoundStage*. The new systems integrate the 56K system with a 386/25 or 386/33 and include 1MB of RAM, a 1.44MB floppy disk and a 28-ms. hard disk.

System features include sample rate conversions, time compression/expansion, a scrubbing window, a mono control (left or right), pitch shifting, SMPTE chase lock, and record undersampling support. The 56K digital editing system is also available as an add-in to

your present system.

List Price: Personal Digital Workstations: 386/25: \$3,695; 386/33, \$4,295. 56K system, \$1,995. **Requires:** For 56K system: 640K RAM, hard disk with 28-ms. random access time or less, AES/EBU or SPDIF-compatible DAT recorder, Microsoft-compatible mouse, DOS 4.01 or later. Turtle Beach Systems, P.O. Box 5074, York, PA 17405; 717-843-6916.

CIRCLE 448 ON READER SERVICE CARD

Dolch First to Ship 50-MHz 486 Portable

NEW **Dolch Computer Systems** has begun shipping the 50-MHz version of its Portable Add-in Computer (P.A.C.) line. The company claims that the machine achieves 21.5 mips (million instructions per second) with the aid of a 128K external cache and a 1MB dedicated cache on the SCSI disk I/O.

The 32-bit EISA-based 486-50E uses a combination of Sharp's active-matrix TFT-color flat-panel LCD and Chips and Technologies' 82C457 flat-panel VGA controller and color algorithm to display 24,389 colors with a contrast ratio of 150:1.

The standard configuration includes 8MB of RAM (expandable to 32MB), a 200MB SCSI hard disk, a 1.44MB 3.5-inch floppy disk, and a VGA gas-plasma display. The active-matrix screen is available as an add-in. The unit offers five EISA expansion slots. **List Price:** Dolch P.A.C. 486-50E, \$16,995; TFT screen, \$3,995. Dolch Computer Systems, 372 Turquoise St., Milpitas, CA 95035; 800-538-7506, 408-957-6575.

CIRCLE 703 ON READER SERVICE CARD

Xircom Cuts Price and Weight of Pocket Ethernet LAN Adapter

IMPROVED **Xircom** has released a smaller, faster, and less-expensive version of its Pocket Ethernet adapter. The Pocket Ethernet Adapter II is the first of Xircom's second-generation portable LAN adapters. Xircom claims that the unit is 20 percent smaller and 40 percent faster than the previous model. The device uses National Semiconductor's single-chip Ethernet controller, the ST-NIC.

Packed into a 0.92- by 2.4- by 4.2-inch (HWD) case, the Pocket Ethernet Adapter II weighs a mere 3 ounces. Indicator lights allow monitoring of transmission activity, collisions, cable fault, and link integrity in 10BaseT environments. The adapter is available with thin coax, AUI, or 10BaseT connectors. **List Price:** Xircom Pocket Ethernet Adapter II, \$495; 10BaseT connector, \$545.

Requires: Open parallel port. Xircom Inc., 26025 Mureau Rd., Calabasas, CA 91302; 800-874-7875, 818-878-7600.

CIRCLE 704 ON READER SERVICE CARD

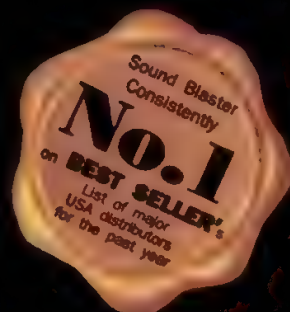
You must have heard how **SOUND BLASTER** took the PC market by storm...

Now the **HURRICANE...**

SOUND BLASTER

Stereo/Music/Voice/Speech/MIDI/CD-ROM Interface/Game Port
The Multimedia Sound Standard

PRO



"It's the next-generation sound card and it is loaded! The operative word is "twice." It has twice the sound channels (22) of the original Sound Blaster with twice the quality of sound in stereo, as well as stereo DACs for digitized speech and sound effects."
Computer Gaming World
August 1991



"With its associated software, it has quietly (no pun intended, but what the heck) become the standard sound system for advanced PCs."

Jerry Pournelle, BYTE June 1991

SEE US AT OUR
3,000 SQ. FT. BOOTH
#S2456
COMDEX FALL
SANDS EXPO, OCT 21-25, LAS VEGAS

COMPUTE August 1991

"...Creative Labs is now turning up the volume with the Sound Blaster Pro. It's basically two Sound Blasters on a single card with additional multimedia features thrown in. It has twin FM chips capable of creating 22 individual voices, two DACs for stereo voice and sound-effects playback, a stereo microphone jack, and a built-in stereo mixer that can adjust the volume of all your Sound Blaster audio sources (stereo DAC, stereo FM, microphone, stereo line-in, CD-Audio and PC internal speaker).

The built-in mixer makes the Sound Blaster Pro fully compliant with Microsoft's Multimedia Level 1 Extensions to Windows. Multimedia software will be able to fade-in, fade-out and pan the various audio sources to create elaborate sound montages.

The Sound Blaster Pro includes a CD-ROM interface for either an internal or external CD-ROM player. There's also an internal connector for CD-Audio. The MIDI interface is compatible with the original Sound Blaster's MIDI interface but adds the MIDI time-stamp that's part of Microsoft's new multimedia standard.

All in all, the Sound Blaster Pro is chock-full of new features, yet it's fully compatible with its younger brother."

Reprinted by permission of COMPUTE ©1991
COMPUTE Publications International Ltd

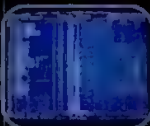
Microsoft and Windows are registered trademarks of Microsoft Corp and Ad Lib is a registered trademark of Ad Lib Inc. Sound Blaster is a trademark of Creative Labs, Inc.

At a devastating price of **\$299.95** and you get a "chock-full of features":

- Stereo DAC for digitized sound output
- Stereo voice recording from mic, CD or Line-in
- Sampling rate 4KHz to 44KHz
- Stereo 22-voice FM music synthesizer
- Stereo mixer with digital volume controls
- MIDI interface with adaptor and cables
- Built-in CD-ROM interface
- Joystick Port
- Microphone AGC amplifier
- Power amplifier (4W per channel)

and loads of **FREE** bundled software:

- MIDI Sequencer
- Pro-Intelligent Organ
- VEDIT2 - Voice Editor & Utilities
- SBTALKER - text-to-speech synthesizer with DR SBAITSO2
- Talking Parrot - voice in/out application
- MMPLAY Multimedia Presentation
- CD music player
- Windows 3.0 DLL and sound applications



"The big question is, at a list price of \$249.95, is the Sound Blaster worth the investment? Yes, yes, a thousand times yes!!!" **PC HOME JOURNAL**

How many "yes!!!" would you give now that the Sound Blaster list price is reduced to **\$169.95!** And you get:

- DAC for digitized voice output
- ADC for voice recording
- 11-voice Ad Lib FM synthesizer
- Full duplex MIDI interface
- Joystick Port
- Microphone amplifier
- Power amplifier (4W per channel)
- Bundled software: • Intelligent Organ
- Talking Parrot • Voice Toolkit
- SBTALKER • DR SBAITSO
- Jukebox for Windows 3.0

Sound Blaster Micro Channel Version is also available.

North America master distributor:
Brown-Wagh Publishing
130D Knowles Drive Los Gatos CA 95030
For your nearest dealer, call 1-800-451 0900
Tel (408) 378 3838 Fax (408) 378 3577

CREATIVE LABS, INC.

2050 Duane Avenue Santa Clara CA 95054
Tel (408) 986 1461 Fax (408) 986 1777

Outside North America, contact:

CREATIVE TECHNOLOGY PTE. LTD.

75 Ayer Rajah Crescent #02-04 Singapore 0513
Tel (65) 773 0233 Fax (65) 773 0353

THE PC SOUND STANDARD

Largest support of Multimedia, Music, Education, Entertainment & Productivity software under DOS and Windows 3.0.

CIRCLE 541 ON READER SERVICE CARD



"ITS A VALUE HUNTERS DREAM..."

Quality Name-brand Products Mean Customer Satisfaction and Assured Reliability.

When you buy a computer, you need a company that carries the latest in technology. You also need a company that will be around for you in future years when you need help with your system or you want to upgrade your system. USA FLEX is that company and our track record proves it.

The Industry Leader in Quality Computer Products and Customer Satisfaction.

USA FLEX has been in business for 14 years and enjoys an established relationship with many of the computer industry's giants. Last year we supplied our customers with over \$100 Million in computer systems and peripherals. That is why we made the INC. 500 list of fastest growing companies for the 6th time, a feat only accomplished by two other companies. Computer Shopper readers have voted us 12 Best Buy Awards, (more than any other company); and Crains Chicago Business Magazine awarded USA FLEX the High Tech Entrepreneurs Award.

Knowledgeable and Experienced Sales Force.

USA FLEX takes a great deal of pride in our products and in our experienced sales force. We have over 50 people dedicated in helping you get the most out of your FLEX Computer. Our telephone consultants go through intensive training to ensure they will be able to recommend the system that will meet your needs as well as your pocketbook.

The Service at USA FLEX Doesn't End with the Sale.



All of our FLEX Computer systems come with a 30 Day Money Back Guarantee and One year on-site service. If you should develop any problems, a special 800 Toll FREE technical support line is provided for our system customers only. Our helpful technical support staff is trained to talk our customers through their computer problems. They can handle problems from simple installation questions to complex networking problems.



FlexNote 386SX/60 Meg

USA FLEX is proud to introduce a new member to its complete line of computer systems - **The FLEXNOTE 386SX Notebook**

Computer System. The main unit is compact, light-weight, easy to carry, IBM® compatible and when combined with an optional docking station, it becomes a powerful desktop 386SX.

- 60 MB Hard Drive
- 32-Bit 80C386SX Microprocessor running at 20MHz
- Socket for optional 80C387SX coprocessor
- Standard 2 MB, maximum 5 MB RAM memory
- 3.5" 1.44 MB Floppy Drive
- CCFT edgelit, paper-white LCD with 640 x 480 resolution
- VGA video controller, fully backward compatible with EGA, CGA, MDA and Hercules
- Super Fast VGA Graphics
- Built in lithium battery backup
- 1 9-pin serial port and 1 parallel port
- MS-DOS 5.0
- Includes **NEW** PC TEST Diagnostics Software

\$1995

WHEN YOU THINK OF
TECHNOLOGY
AND SERVICE AT ITS BEST...

USA  **YOUR
PC
PARTNER**

...THINK OF USA FLEX!

...BUY IT!"

— Steve Gilliland
Computer Shopper



USA FLEX recognizes the obligation we have to our customers.

We are committed to providing more than just convenient shopping for our customers, we want to answer any and all questions they may have. It is our vision to instill such confidence in our potential customers, that they will become not just a one-time buyer but a regular customer - one that will be satisfied for years to come. To this USA FLEX and its staff are dedicated.



FLEX 286/16 MHz
Complete System

Perfect for Students 16 MHz System **\$799**

Microprocessor: 286 running at 16 MHz
Special Features: Includes both 3.5" 1.44 MB and 5.25" 1.2 MB Floppy Drives, NEW PC TEST Diagnostics Software and MS-DOS.
Storage: 44 MB hard drive
Memory: 1 MB RAM
Video: 12" Monochrome monitor with Hercules video adapter board. Other options available. Call for details.
Warranty: One year on-site service.



FLEX 386SX 16/20MHz
Complete System

16 MHz System **\$1475** 20 MHz System **\$1550**

Microprocessor: 386SX running at 16 or 20 MHz
Special Features: Includes both 3.5" 1.44 MB and 5.25" 1.2 MB Floppy Drives, MicroSoft Window 3.0, Lotusworks software, Mouse, MS-DOS and NEW PC TEST Diagnostics Software.
Storage: 106 MB hard drive
Memory: 2 MB RAM
Video: Super VGA 1024 x 768 color monitor with 16-bit 1024 x 768 Super VGA card. Other options available. Call for details.
Warranty: One year on-site service.



FLEX 386DX/25 MHz
Complete System

25 MHz System **\$1699**

Microprocessor: 386 running at 25 MHz
Special Features: Includes both 3.5" 1.44 MB and 5.25" 1.2 MB Floppy Drives, MicroSoft Window 3.0, Office Manager Software, Mouse, MS-DOS and NEW PC TEST Diagnostics Software.
Storage: 106 MB hard drive
Memory: 2 MB RAM
Video: Super VGA 1024 x 768 color monitor with 16-bit 1024 x 768 Super VGA card. Other options available. Call for details.
Warranty: One year on-site service.



FLEX 386DX/33 MHz
64K Cache

For interlaced monitor **\$1850**
For non-int. monitor **\$1950**

Microprocessor: 386 running at 33 MHz
Special Features: Internal 64K Cache, includes both 3.5" 1.44 MB and 5.25" 1.2 MB Floppy Drives, Windows 3.0, Office Manager Software, Mouse, MS DOS and NEW PC TEST Diagnostics Software.
Storage: 120 MB hard drive
Memory: 4 MB RAM
Video: Super VGA 1024 x 768 color monitor with 16-bit 1024 x 768 Super VGA card. Other options available. Call for details.
Warranty: One year on-site service.



"The USA FLEX System is the only system that passed all quality control checks the first time."

— Smithsonian Observatory

"The only computer system I will allow on our networks is the FLEX System."

— DePaul University

"Support is critical, when I called USA FLEX with a question I had the right answer in seconds."

— US Naval Supply

"USA FLEX's Toll Free Technical Support and On-site service makes their systems an unbeatable value."

— Illinois Department of Health and Human Services

- 24 Hour Technical Support, 7 Days A Week
- 800 TOLL FREE Customer/Technical Service Number Available
- One Year On-site Service Warranty
- 30 Day Money Back Guarantee



FLEX 486/33 MHz
64K Cache

For interlaced monitor **\$2895**
For non-int. monitor **\$2995**

Microprocessor: 486 running at 33MHz
Special Features: Internal 64K Cache, includes both 3.5" 1.44 MB and 5.25" 1.2 MB Floppy Drives, Windows 3.0, Office Manager Software, Mouse, MS DOS and NEW PC TEST Diagnostics Software.
Storage: 200 MB hard drive
Memory: 4 MB RAM
Video: Super VGA 1024 x 768 color monitor with 16-bit 1024 x 768 Super VGA card. Other options available. Call for details.
Warranty: One year on-site service.

1-800-800-4395

1-800-800-4395 M-F 7am to 7pm & Sat. 9am - 2pm
TOLL FREE CUSTOMER/TECHNICAL SERVICE NUMBER AVAILABLE
FAX (708) 351-7204

Please refer to code # PM1101 when placing an order.

135 N. Brandon Drive, Glen Ellyn, IL 60139



DTK 486 drives high-performance software in PC Week Labs test.

When *PC Week's* editors asked PC Week Labs to test Autodesk's® Renderman™ software, a DTK i486™ computer was chosen to run the sophisticated, high-level shading software program. (The drawing shown above is representative of the high quality of Renderman™ output.)

It takes a lot of muscle to get the full benefits of Renderman's™ power; we build that muscle into every DTK i486™ system™.



We begin with Intel's® potent i486™ processor (with its built-in cache and floating-point coprocessor circuitry) and add a second-level 64KByte static Ram cache (expandable to 256KBytes) for even

more impressive productivity levels.

Add to these your choice of hard drives and controllers, a fast graphics card and a post-VGA high definition monitor, and you have a PC screamer that can handle even the toughest of jobs ... while still affordably-priced.

When power and dependability are important, DTK is the computer of choice of people who know. Perhaps it's time you considered a DTK i486™ for your next computer. Call one of the DTK branch offices below for the name of a reseller near you.



The DTK 486 Family ■ 486-33 ISA ■ 486-33 EISA ■ 486-25 ISA ■ 486SX-20 ISA



DTK Computer Inc. A Reputation for Success.

17700 Castleton Street, Suite 300 / City of Industry (Los Angeles), CA 91748 / (818) 810-8880 / FAX (818) 810-5233

Los Angeles
(818) 810-0098

San Jose
(408) 436-6363

Houston
(713) 568-6688

Chicago
(708) 593-3080

New York
(908) 562-8800

Miami
(305) 597-8888

Autodesk is a registered trademark and Renderman is a trademark of Autodesk Inc. The DTK Logo is a registered trademark of DTK Computer Inc. Intel is a registered trademark and the Intel Inside Logo and i486 are trademarks of Intel Corporation. Design and specifications subject to change without notice. ©1991. DTK Computer Inc.

CIRCLE 102 ON READER SERVICE CARD

edited by
Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

Fractals: At Play with Hard-core Algorithms

These days it's not uncommon for PC tutorials to come with a disk, but the paraphernalia for *The Waite Group's Fractal Creations* evokes memories of the Beatles' magical mystery tour. This lesson in fractals, by Timothy Wegner and Mark Peterson, includes 3-D glasses, a psychedelic poster, and an interactive fractal-generating program, *Fractint*. It all adds up to a magical ride complete with both the mathematical background necessary to appreciate and understand fractals, and the software, which allows you to display and manipulate them, even in 3-D.

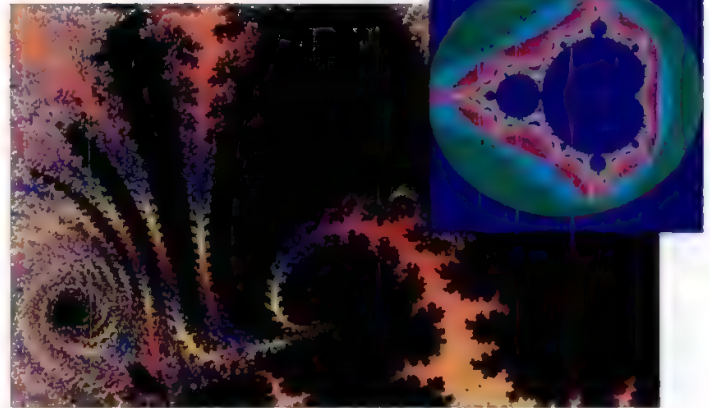
The authors present a lucid, 40-page introduction to fractals—designs of infinite structure and complexity, often with “self-similar” characteristics. Mountains are a good example, infinitely diverse, but similar in the way that foothills resemble taller slopes.

Fractal's founding father, IBM scientist Benoit Mandelbrot, coined the term from the Latin *fractus* meaning *irregular*, from the verb *frangere*, *to break*, and it's here that the book begins. The discussion deftly switches to the complex number underpinnings (real and imaginary number combinations) of the Mandelbrot algorithm. The authors show that the power of fractals lies in the mathematical algorithms used to represent them visually.

The remaining two sections comprise the lion's share of the book. “Using *Fractint*” walks you through the included software, which is guaranteed to blow your eyes out. “Fractal Types” discusses 45 additional fractals you can substitute for the baseline Mandelbrot set. Power thinkers can explore appendices on imagi-

nary numbers, complex trigonometric functions, and C programming implementations. For those with a programming bent, the book comes with the C source code for *Fractint*.

The *Fractint* contributor's club, the “Stone Soupers,” has provided support for most video adapters, including Super VGA. And while parts of *Fractint* are not user-friendly, you don't need to be a programmer to enjoy it. For \$34.95, there is plenty here to entertain you. Who knows? Perhaps your fractal creation will be discovered by Spielberg or Lucas. —DavidDean



Fractint lets users explore the Mandelbrot set (inset) and 70 other fractals.

The Waite Group's Fractal Creations

by Timothy Wegner and Mark Peterson, \$34.95, Waite Group

Press, 100 Shoreline Hwy., Ste. A-285, Mill Valley, CA 94941; 800-368-9369, 415-331-0575.
ISBN 1-878739-05-0.

CIRCLE 416 ON READER SERVICE CARD

As DOS Documentation Improves, Does The Need for DOS 5.0 Books Diminish?

Microsoft committed huge amounts of both technical and financial resources to bring DOS 5.0 up to fighting trim. Part of that effort went into changing its *DOS User's Guide and Reference* into a 670-page all-you-need-to-know-about-DOS heavyweight. As a result, books like Sybex's *DOS 5 User's Handbook* aren't as necessary as they once were to understand the operating system. A DOS 5.0 book should offer more “value-added” information, and authors Gary Masters and Richard Allen King rise to the challenge with mixed success.

The first two chapters outline DOS 5.0's new features and give an exemplary description of the types of memory and how the new device drivers and utilities can be used to free additional RAM. These pages should be re-



quired reading for everyone using DOS 5.0.

Masters and King devote an entire chapter to QBasic (which replaces GW-BASIC in DOS 5.0). They describe the new environment thoroughly, covering the changes that Microsoft overlooked, but they don't touch upon QBasic programming techniques.

A reference guide lists all the DOS commands along with a historical perspective on DOS's evolution. Masters and King tell you when the command was introduced, and what changes have been made in DOS 5.0.

The DOS 5 User's Handbook is no simple rewrite of the DOS manual, but it's often a retelling of the same story. To their credit, Masters and King embellish many of the commands with explanations that are easier to understand than what Microsoft wrote

in its user guide, but the improvement is not dramatic.

The DOS 5 User's Handbook has two other strikes against it. First, in the reference guide, Sybex uses too many different fonts on a page—sometimes as many as seven. The result is difficult to read. Second, Microsoft's *User's Guide and Reference*, which is included in the DOS 5.0 upgrade, is more complete.

Since DOS is the operating system that more than 50 million computers use, the aftermarket for DOS books could be enormous. Sybex's *DOS 5 User's Handbook* offers competent coverage of the subject, but for the first time in the history of DOS, most users might be better off reading the manual.—Christopher Barr

The DOS 5 User's Handbook

by Gary Masters and Richard Allen King, \$21.95, Sybex Inc., 2021 Challenger Ave., Alameda, CA 94501; 800-227-2346, 415-523-8233. ISBN 0-89588-777-0.

CIRCLE 417 ON READER SERVICE CARD

IT'S EASY TO SPOT
FAULTY DISKS.
COMPUTERS SWEAR
BY THEM.

[illegible]

**Computers are smart.
Use a bad disk, and
they'll tell you. With
a pointed mes-**

sage like the one you see on the screen above. Now, you can do one of two things. Swear right back at your com-

puter. Or start using BASF disks. Made by the people who invented magnetic recording.

BE SAFE. BASF.



BASF

CIRCLE 130 ON READER SERVICE CARD

Read Only

Edelhart Empowers Novell Network Managers

Novell NetWare Power Tools is designed to provide assistance to all users of *NetWare* from the now-discontinued *Entry Level System (ELS)* through 286, Version 2.2, and 386, Version 3.11. Written by Mike Edelhart, the publisher and editor-in-chief of *PC/Computing*, the book's \$49.95 price makes it one of the most expensive paperbacks on the market. A high-density 3.5-inch disk of useful utilities and some solid networking information justifies its high price.

NetWare Power Tools starts with the basics: an overview of networking, from software to

hardware, and how to set up the best network for you. Edelhart then shows you how to get the most performance from your workstation and server and from *NetWare* commands.



One of the most aggravating parts of a LAN installation is installing and optimizing software. Edelhart spends an entire chapter on just how to accomplish this critical task.

He follows this with a competent examination of two of the most overlooked but critical aspects of managing a LAN: backup and maintenance.

The chapter on troubleshooting *NetWare* provides you with a collection of workarounds for problems that you might encounter someday. While the solutions might not always fit your situation, many will point you in the

right direction. This ambitious section also demonstrates one of the book's problems. It is confusing to find what you're looking for because of different type treatments; for example, headings often blend into body text.

NetWare Power Tools provides invaluable information on LAN gateways in the form of "53 questions for gateway vendors" compiled by Diane Danielle, a LAN manager, during her search for a gateway. You'll need to adapt these questions on session and printer management, gateway hardware, vendor support, and performance to your own needs. But if you pose these questions and carefully weigh the responses, you will be able to pick the best gateway to fit your LAN and minimize the number of potential surprises after your gateway is installed.

NetWare Power Tools also bundles 36 programs, utilities, and batch files on a 3.5-inch disk.

Edelhart takes care to give descriptions and documentation on each one in the final chapter of the book. While most users will be able to find a PC with a 3.5-inch drive on their network, if a 5.25-inch disk is a must, it will cost you an additional \$7.95. Since the book is \$49.95 to start, Bantam should make the swap free.

Novell NetWare Power Tools is a tool that you should have on hand throughout your *NetWare* LAN's life cycle. Edelhart provides more than a regurgitation of *NetWare* commands: He gives a hands-on approach to managing your LAN, every step of the way.—Wendy Dugas Pérez ■

Novell NetWare Power Tools

by Mike Edelhart, \$49.95, Bantam Computer Books, 666 Fifth Ave., New York, NY 10103; 800-223-5780, 212-765-3535. ISBN: 0-553-348966-X.

CIRCLE 418 ON READER SERVICE CARD



"Only PrintDirector gave us a cost-effective solution for every size work group & wiring configuration in our company."

Now make everyone who shares printers grin from ear to ear.

Send for your free white paper. Get the story on the only manufacturer with a full range of models and wiring options to solve all your peripheral sharing problems. See why PrintDirector — with 600,000 users worldwide — was the '91 winner of *PC Magazine's* Editors' Choice award.

Discover how to print at up to 100,000 BPS using PrintDirector. And print right the first time — every time. For a price that will make you happy.

Flexible
Printer
Sharing
Solutions

FREE

"PrintDirector lets us print our graphics applications in about half the time of other products."

For your free white paper, free catalog and "Keep 'Em All Smiling" guarantee certificate, call:

1-800-243-2333 Ext. 98 (in MA 617-924-1680)



**DIGITAL
PRODUCTS, INC.**

the leader in printer sharing
108 Water Street, Watertown, MA 02172

PrintDirector is a registered trademark.



Printer sharing with PrintDirector is guaranteed to keep everyone smiling.



"With PrintDirector's easy file transfer capabilities, we saved a small fortune by not buying a LAN."



"Just plug it in and forget about it. PrintDirector feels like you're using a dedicated printer."



CIRCLE 745 ON READER SERVICE CARD



If there were a printer that could give you this kind of color, would you still make your presentations in black and white?

Do your presentations go in one eye and out the other? The Colormate[®] PS 40 can easily and affordably give them the impact they deserve, enhancing your work with truly amazing color.

The Colormate PS 40 integrates readily with any network, PC or Mac. And it's compatible with most popular presentation software. Of course,

Adobe[®] PostScript[®] is standard, so you can scale, rotate and shade the 17 resident fonts. 300 DPI graphics means that output is sharp and clear, whether paper or transparencies. And with its small footprint, the Colormate PS 40 won't fill up your desk.

After all, the world isn't black and white, why should your presentations be?



CIRCLE 375 ON READER SERVICE CARD

edited by
Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

MultiScope Redefines Debugging For Windows and DOS Platforms

It was no surprise when Logitech's *MultiScope OS/2 Debugger* won *PC Magazine's* coveted Technical Excellence Award (January 16, 1990): It was the first windowing, GUI-based debugger with an interface that displayed over a dozen different views of your program. Fortunately, this innovative approach to debugging is available to DOS and *Windows* programmers.

MultiScope Debuggers for Windows supports any programming language that can generate *CodeView*-compatible debug symbol tables including Microsoft C, Pascal, BASIC, and Macro Assembler. It does not yet support Borland language products, which is particularly unfortunate in the case of TPWin and BC++ since these were designed for *Windows*.

The \$379 package contains about a dozen variants of its Run-Time, Post-Mortem, and Remote Debuggers. For example, the Run-Time Debugger (RTD) includes debuggers for DOS and *Windows* Real mode, and for *Windows* Protected and 386 Enhanced modes. In addition, each debugger offers character-mode interfaces as well as *Windows*-based GUIs, includes extensive interactive help and, where appropriate, offers dual monitor support.

If you have a 386- or 486-based machine, *MultiScope* offers 80386 virtual machine debugging capabilities (for debugging huge applications at full speed), with support for 386 data references, range watchpoints and breakpoints, as well as I/O and interrupt breakpoints. In this mode, the debuggers use as little as 8K of the application's memory space. The virtual 386 device driver can



emulate expanded memory in extended memory, and provide additional EMS and VCPI support.

The two greatest strengths of *MultiScope Debuggers for Windows* are that it lets you debug your DOS and *Windows* programs in *Windows*, and it shows you multiple, simultaneous views of your program. Using the *Windows* interface, you can graphically display your application's data structures, and both the CPU register contents and the registers of a math coprocessor (if installed). The *Windows* MDI lets *MultiScope* contain each view in a child window that can be minimized and maximized.

When I first reviewed the *MultiScope OS/2 Debugger* (First Looks, October 31, 1989), I said that accessing debugging commands only through pull-down menus or accelerator keys was too limiting. *MultiScope* listened. This product debuts a remote-control facility that uses a VCR metaphor to encapsulate the primary debugging commands into a single unit. In contrast to a floating toolbar, it stays on-screen even after you minimize the debugger, minimizes screen swaps, and increases the amount of screen space available for debugging.

RTD offers the usual commands such as Until Function Return, Animate, and Restart, but the command interface is not as broad as its competition's. For instance, it doesn't have a Back Trace command as Borland's *Turbo Debugger* does. The *MultiScope* command names also aren't consistent with those already in use. *Turbo Debugger* and *CodeView*, for example, use Step for

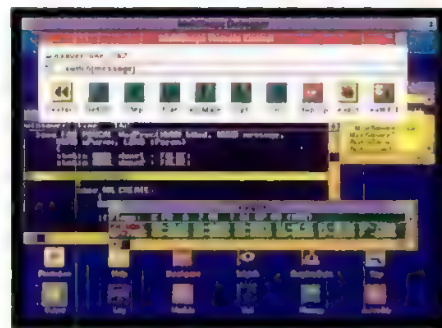
executing across a function call and Trace to execute into one. *MultiScope* uses Flat and Step, respectively. Finally, some of the commands, such as Eject and Power, are not documented at all.

MultiScope Debuggers for Windows has many features you simply won't find in other debuggers. For example, a Log window lets you track the commands executed during a debugging session and post this information to a disk file, and a Spy window lets you track messages sent to an application's windows (while *Turbo Debugger* offers this feature, *MultiScope* identifies some of the undocumented *Windows* messages by name).

the exception occurred. The *Windows* PMD also includes options for saving the *Windows* kernel and capturing the contents of the global heap.

MultiScope's Remote Debugger lets you debug an application on another machine, whether it's on a network or attached via a serial line. The network debuggers are faster but use more memory; the serial remote debuggers have lower memory requirements but do not operate as fast.

My gripes with *MultiScope Debuggers for Windows* are few: It should have supported Borland language products; WINDEBUG.DLL, the only file you need from the *Windows* SDK, should have



With *MultiScope's Windows*-based interface you can use multiple windows to display source code, breakpoints, variables, and other program components while you DEBUG an application.

Moreover, you can automatically treat each message's IPParam as a memory address to be viewed, and manually post messages to other windows.

MultiScope's Post-Mortem Debugger (PMD) lets you analyze the state of a program after it crashes. (To use it with a DOS program, you need only to link in a special library; an execution monitor system is provided for use with *Windows* applications.) When a runtime exception or *Windows* UAE occurs, the monitor or library code will capture the state of the program to a disk file. Analysis of this file shows you the state of memory, the CPU registers, and the contents of your program's variables at the moment

been included; and, as I mentioned earlier, the documentation could have been better. However, where *MultiScope for PM* advanced the state of debugging, *MultiScope Debuggers for Windows* has redefined it for DOS and *Windows* platforms.

—Richard Hale Shaw

MultiScope Debuggers for Windows, Version 1.01.

List Price: \$379; DOS debuggers only, \$179. **Requires:** 640K RAM, 3MB hard disk space, DOS 3.3 or later *Microsoft Windows* SDK. *MultiScope* Inc., 1235 Pear Ave., #111, Mountain View, CA 94043; 800-999-8846, 415-968-4892.

CIRCLE 695 ON READER SERVICE CARD

Now that it's such
a popular E-mail program,
maybe we should call it Post Office.



When WordPerfect Corporation created WordPerfect Office,[™] we set out to simplify the way people organize their days, schedule their meetings and communicate with their colleagues. In short, to streamline many of the most common day-to-day tasks in any office environment. And that's exactly what WordPerfect Office can do.

But meanwhile, it's also become the fastest-growing E-mail package for PCs.

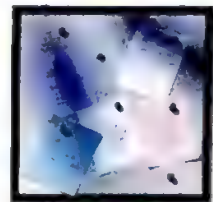
And that seems only natural. Because WordPerfect Office lets you quickly and easily send documents, memos



and schedules to the "in-boxes" of everyone on your mailing list—across the hall, across the street, wherever they're connected to WordPerfect Office.

Plus, WordPerfect Office has gateways that allow you to communicate with many other kinds of E-mail systems—MCI, AT&T Easylink and MHS, for instance.

And unlike most E-mail packages, WordPerfect Office organizes your messages in "in-boxes" and "out-boxes" and lets you check their status anytime. If you've sent a message that has not yet been read, for example, you can retrieve it and make changes. You can even delete the message completely, as though it had never been sent.



WordPerfect OFFICE

Office Automation Software
for IBM® PC Networks



So why didn't we call it "Post Office"? Because WordPerfect Office isn't limited to just E-mail. WordPerfect Office includes such useful functions as a calendar, a calculator, and a file manager. And its scheduler program lets you coordinate and schedule people and resources efficiently, avoiding conflicts and endless back-and-forth telephone tag.

What's more, you can count on WordPerfect Office to have all the familiarity, ease-of-use and incomparable user support you've come to enjoy in WordPerfect.®

Maybe it's because WordPerfect Office can do so many things so well that *InfoWorld* chose it as "Office Automation Product of the Year for 1990."



So if you want the PC's fastest-growing E-mail package—and you don't mind getting some really great additional features—just call (800) 526-5162 for a free demo diskette or a WordPerfect Office brochure. Or, if you prefer, send a message to MCI 4478847: Customer Service or AT&T Easylink 62024736.

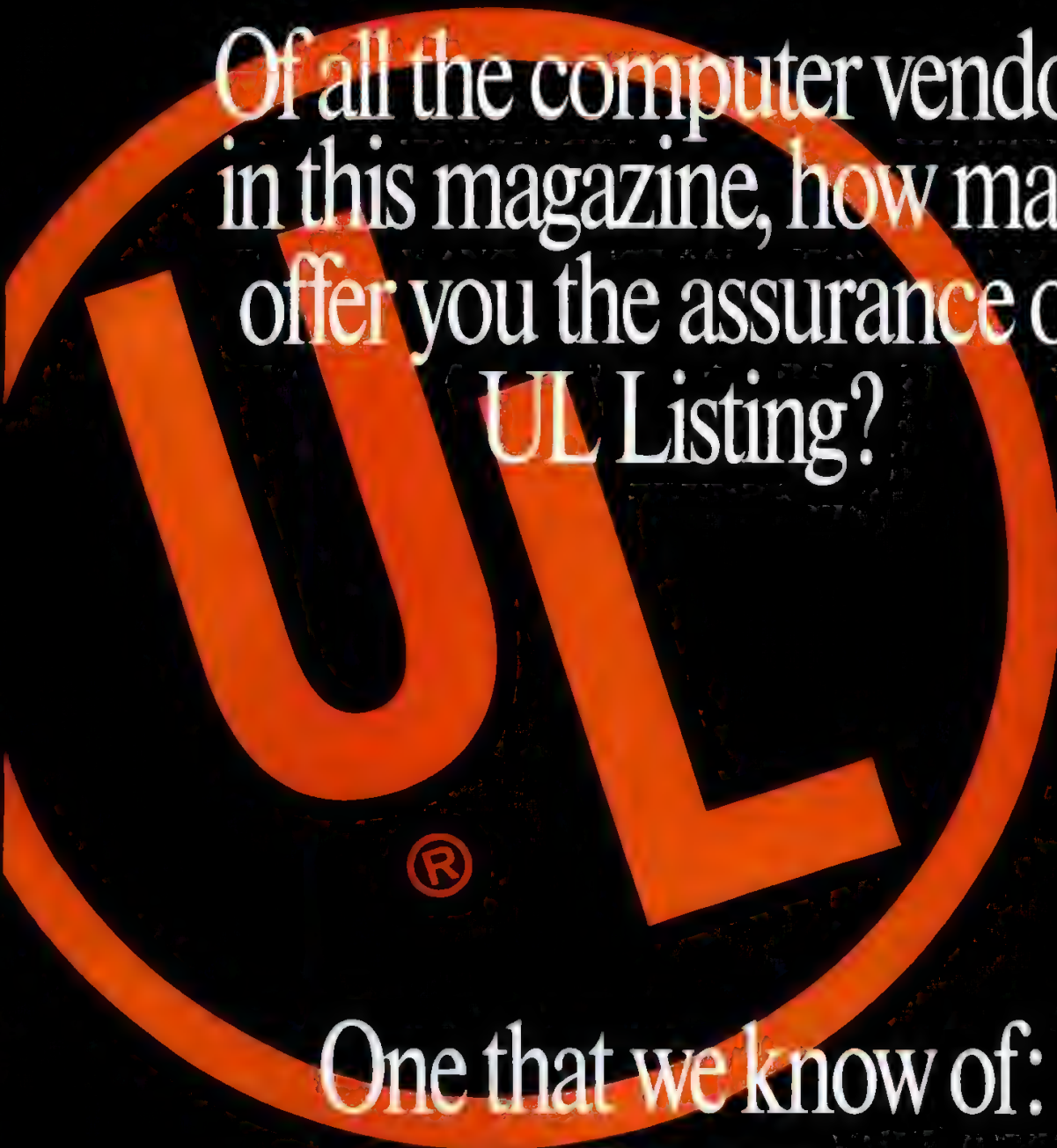
You'll not only be getting a better post office, you'll be getting a better office.



WordPerfect
CORPORATION

1555 North Technology Way, Orem, Utah 84057
Tel: (801) 225-5000 FAX: (801) 222-5077

WordPerfect is a registered trademark and WordPerfect Office is a trademark of WordPerfect Corporation in the United States and other countries. All other brands and product names are trademarks or registered trademarks of their respective companies.
© 1991 WordPerfect Corporation.



Of all the computer vendors
in this magazine, how many
offer you the assurance of
UL Listing?

One that we know of:
ZEOS[®]
Every System UL listed.

For more information on ZEOS systems
call 800-423-5891.

CIRCLE 513 ON READER SERVICE CARD

Michael J. Miller



The Killer App

Today, compatibility is such a large issue for personal computing that it overshadows any desire users might have for the next great, but nonstandard application.

A few years ago, whenever anyone talked about changing operating systems, you heard people talk about a "killer app"—an application so good and so important that it would make people adopt a new system such as *Windows* or *OS/2*.

I, too, thought there would be such a breakthrough. After all, *Visicalc* was essential for the success of the Apple II standard, *WordStar* helped establish CP/M, *Lotus 1-2-3* was crucial in the success of MS-DOS, and the Macintosh would have been a flash in the pan if it weren't for *Microsoft Excel* and *Aldus PageMaker*. It's been a long time; surely, we thought, the next killer application was just waiting to emerge.

We were wrong. Several years have passed, and still no killer app is in sight. What happened?

In order to be successful, a new operating system has to be both necessary and sufficient. Necessary in the sense that it must give computer users a compelling reason to switch. And sufficient in that it must have enough functionality to do all of the things that a computer user would want to do. The killer application has been the necessary component of each new operating system. But recent operating systems just haven't been sufficient.

Take the early versions of *OS/2*. At first, there weren't many native word processors, spreadsheets, or databases. Most of what existed were almost exact copies of the DOS versions. Worse, *OS/2* 1.0 and 1.1 did a terrible job of running DOS programs, and each had incredibly limited printing capabilities (basically, they worked well only with IBM-brand printers.) Forget about finding a necessary application; even if one existed, the operating system wasn't sufficient.

The same complaint could be leveled at the first two major releases of *Microsoft Windows*. Neither one ran DOS programs that well, and most of the *Windows* applications were simply too slow compared with their DOS counterparts. As a result, the operating environment

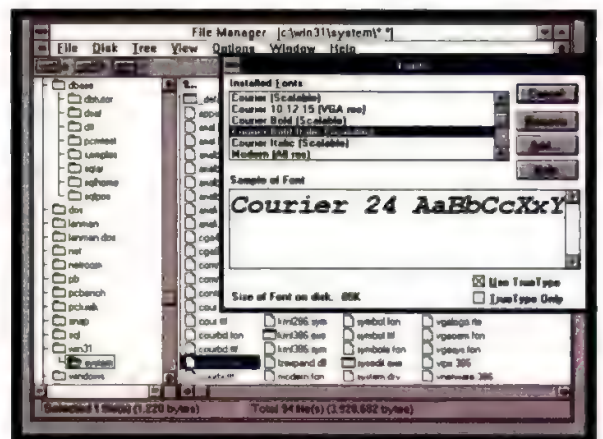
won very few adherents, although individual applications offering unique functionality (such as *Excel*, *PageMaker*, *Micrografx Designer*, and *CorelDRAW*) did attract their users. These applications could prosper because you could run (and indeed had to run) *Windows* on a machine that was already running DOS.

Only with Version 3.0 did the *Windows* operating environment come close to being a sufficient system for most of us. Now it can run DOS programs pretty well, it's much more stable (although not as stable as you'd like), and much faster (although not as fast as you'd like.) It's been good enough to attract a sizable core of *Windows* loyalists, but it probably isn't fast or stable enough yet for the average user.

SYSTEM SUFFICIENCY

Over the next few months, we're going to see both IBM and Microsoft pushing the next versions of their operating systems. I've been spending some time working with prerelease copies of each. Note that neither company is talking about killer applications anymore; instead, the focus seems to be on making the environments more "sufficient."

Windows 3.1, which Microsoft expects to



Windows 3.1 will ship later this year with an improved File Manager, and support for *True Type* scalable fonts.

release by the end of the year, is a good example of this system sufficiency push. Its only major new feature is the inclusion of *True Type*, an outline font rasterizer that lets you display and print type in any size you'd like, without filling your hard disk with megabytes

Michael J. Miller

worth of bitmapped fonts in every size you use. The rest of the upgrade is taken up with improving Microsoft's File Manager (which was nearly unusable in *Windows 3.0*); making the system faster, particularly in disk access; and in making the system more stable. All of these

changes are important, but none are designed to make the environment any more powerful for programmers.

That's not really true of OS/2 2.0, which IBM is promising for this fall. It does offer a major advantage for programmers: Version 2.0 gives developers the ability to write true 32-bit applications, as opposed to the 16-bit applications now being written for OS/2 1.x or *Windows 3.x*. In theory at least, 32-bit

applications should be faster and more powerful than their 16-bit counterparts. But while that may be the biggest advance for programmers and could theoretically help create necessary apps, IBM is spending much more time talking about making the operating system sufficient.

When IBM officials talk about OS/2 2.0, the phrase that comes up time and time again is "a better DOS than DOS and a better *Windows* than *Windows*." IBM promises that this version of OS/2 will let you run multiple DOS applications, each in its own virtual machine and with more memory than is currently available under DOS. It's supposed to let you run *Windows* applications side-by-side with OS/2's native Presentation Manager applications, too. I say "supposed to" because this feature had yet to be implemented in the most recent prerelease copies I've seen as of mid-August.

If OS/2 works as advertised, direct support for *Windows* apps could end up undermining the creation of that one killer OS/2 application. Because if OS/2 runs *Windows* applications well, there won't be any incentive for software developers to write Presentation Manager applications, even 32-bit ones.

What seems to have happened is that the need for compatibility—the need for sufficiency—has grown so important that it has overshadowed other concerns; and most computer users today don't see a need for a radically new application.

But that doesn't mean there will never again be a killer application. OS/2's ability to have real multitasking and multi-threaded applications means that you can develop real applications with multiple communication sessions—something you can't do in DOS or *Windows* today.

The future holds the promise for several very new kinds of applications. The addition of "multimedia" capabilities—video, sound, and graphics control—could let some enterprising software developer create a "must have" game or education product. Pen-based computers, almost by definition, require new kinds of applications, or at least new functions within existing applications. And work being done in areas such as artificial intelligence, neural networks, and voice recognition could lead us to new ways of working, which certainly could be fueled by one or more radically new applications.

So for now, the idea of the killer application has faded. But my guess is, it's an idea whose time will come again. ■

NEED A NETWORK? HERE ARE 10 REASONS WHY YOU NEED PC-MOS™

- 1. PC-MOS is the world's leading DOS-compatible multiuser operating system.** Over 150,000 users take advantage of PC-MOS's support of low-cost dumb terminals or graphics workstations attached to a host PC.
- 2. PC-MOS takes advantage of the latest PC technology to save you big bucks.** For a cost less than that of a network of cheap 286 clones, your users can share the benefits of today's 386- and 486-based hardware. Your investment is in current, not obsolete, technology.
- 3. PC-MOS works with networks.** The Software Link offers the PC-MOS Gateway to Novell's NetWare for easy integration of shared processing workgroups into NetWare LANs. Or you may choose to use our LAN, LANLink 5X, to connect your PC-MOS systems.
- 4. PC-MOS gives users the advanced operating system features they need.** Multitasking, print spooling, memory management, disk caching, security and enhanced batch file language capabilities are just a few of the advanced features of PC-MOS.
- 5. PC-MOS reduces your hardware maintenance costs.** PC-MOS typically requires less administration than a LAN or Unix system. And because it connects dumb terminals or workstations rather than fully-configured PC's, maintenance costs are minimized.
- 6. PC-MOS protects your investment in DOS.** Because PC-MOS is DOS-compatible, most of your current DOS-based applications can be used in the PC-MOS environment, eliminating costs of new software and training.
- 7. PC-MOS flexibility lets your system grow with you.** As your needs change, you can add remote or local users or workgroups, integrate local area networking, and add minicomputers and mainframe computers.
- 8. PC-MOS is ideal for shared database applications.** Because the computer's bus provides faster communication than LAN connections, activities that require heavy disk access perform better with PC-MOS.
- 9. PC-MOS is easy to use for application development.** Programmers familiar with DOS can easily learn how to make the most of PC-MOS's intertask communication, data sharing and other features.
- 10. The Software Link is a company you can depend on.** The creator of PC-MOS has been a leader in the development of award-winning systems-level software since 1983.



The Software Link

3577 Parkway Lane Norcross, Georgia 30092 1-800-766-LINK (404) 448-5465 FAX (404) 263-6474

Products referenced are trademarks of their respective companies. Prices, policies and specifications are subject to change without notice.

FastMicro Blows the Lid off Product Quality



"the component list reads like a Who's Who in the computer world"

-Computer Shopper June 1991

Our case is engineered for maximum expandability in a compact design. It features 5 drive bays and 8 expansion slots, yet it is just 16.5" wide. Its 1.2mm steel thickness and nickel plating assure strength and low RF noise.

Order our 'speed' bundle and we include the incomparable Diamond SpeedSTAR VGA board. It's more than twice as fast as most other VGA boards. PC Week states: "SpeedStar was a scorcher in (our) tests" We also include the ViewSonic 6 non-interlaced SuperVGA monitor - a quality product manufactured by Matsushita (Panasonic's parent company).

For quality and performance second to none, we include the Toshiba 105mb MK234FCF IDE drive. It includes an integrated 32K cache for maximum throughput. It's one of the fastest IDE drives money can buy; in fact, it's tested to be faster than similar sized IDE drives from Seagate, Conner, Rodime and Quantum. What about reliability? Toshiba got the highest hard disk reliability rating in the PC Magazine service and reliability issue.

Even our power supply is designed to last, with an 80,000 hour MTBF, built-in line voltage regulation, and short circuit protection. Its low-profile design and whisper-quiet fan is specially designed to keep your system cooler and quieter.

We utilize genuine Teac floppy drives, not cheap knock-offs in our systems. Teac cost more, but customers forget price quickly and remember quality forever.

All systems include a Key Tronic keyboard, the top name in PC keyboards. Key Tronic costs about 50% more than brands such as Chicory and others, but our customers are worth it.

The FastData name is your ultimate assurance of quality, value and satisfaction. Every single component listed here costs more than other parts. Why don't we make more money and ship cheaper parts? Because we have been building systems for over five years and want you as a customer for life, not just today.

The main system board is the single most important component in your system. Only accept names you know and trust. Both systems featured here use Mitac main boards. Mitac is the largest supplier of its type to manufacturers in North America, (bigger than Micronics or DTK). And Mitac's 17 years of experience ensures quality and innovation.



You can have FastData quality right now for near the price of an average PC. FastMicro builds the best 386 PCs because we use only the best components in every FastData Personal Computer we build. But the quality doesn't stop after we build and ship your new system! Every step of the way, a member of the FastMicro team is ready to make your total computing experience a success.

Other system vendors send you searching elsewhere when you actually need software to run on their system. Is that system support? After all, the reason you buy a computer is to run software on it. FastMicro is one of the largest software distributors in the nation; whatever your need, the FastMicro team is standing by to provide the solution.



Have a question? Call us seven days a week. Our support engineers are standing by to make your FastData system perform to its greatest potential. When you buy a FastData Personal Computer, you are covered by Toll-Free technical support for life. And since we sell more software than other computer companies, we are uniquely qualified to give the proper support our customers deserve.



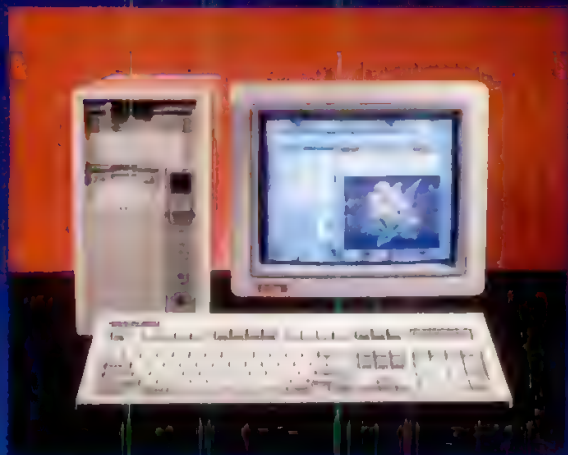
Need Service? If you have a problem, we want it solved - fast. Call us Toll-Free, we'll work with you to determine what's wrong; in most instances we can solve the problem right over the phone. In the unlikely event your system is down, it's our goal to get your system back up - and quick. If a part has failed, we'll get a replacement part out the door FedEx the same day (Mon-Fri) and we'll pay to get the problem part back to us once you're up and running. Call others with express parts replacement, do they pay FedEx both ways? Probably not. If that doesn't solve the problem, we'll dispatch on-site service or completely replace your computer at no charge to you. When FastMicro talks service, we mean it.



FastData 386SX/20c \$1499

Includes

- ✓ 20mhz Intel™ 386-SX processor with 32K Cache.
- ✓ 2 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with keylock, speed and reset buttons.
- ✓ 200 watt power supply.
- ✓ 14" Super VGA color monitor with 1mb 16 bit VGA card.
- ✓ Add \$200 for a 14" non-interlaced Super VGA monitor with ultrafast SpeedSTAR + 1mb VGA with 72hz refresh.
- ✓ Clock calendar, parallel port, 2 serial ports, and game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 80387-SX coprocessor socket.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.



FastData 386DX/33c \$1899

Includes

- ✓ 33mhz Intel™ 386-DX processor with 64K Cache.
- ✓ 4 megabytes of high speed RAM.
- ✓ 105 mb 10ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Mini-Tower (shown) or standard chassis with keylock, speed and reset buttons.
- ✓ 200 watt power supply.
- ✓ 14" Super VGA color monitor with 1mb 16 bit VGA card.
- ✓ Add \$200 for a 14" non-interlaced Super VGA monitor with ultrafast SpeedSTAR + 1mb VGA with 72hz refresh.
- ✓ Clock calendar, parallel port, 2 serial ports, and game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 80387-DX coprocessor socket.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.

Who's FastMicro? We're glad you asked that question. FastMicro is one of the oldest and largest direct computer companies in the U.S. In fact, we've been building our own line of PCs for over five years. Many competitors claim years of experience, we suggest taking them up on it. Go to your local library and look in the back issues of your favorite PC magazines, where are they? Every month, other direct computer companies close up shop; we've seen them come and go. FastMicro will be there before and after the warranty expires.

FastMicro makes it easy to own a FastData personal computer. Call toll-free seven days to ask a question, get a price, or place an order. Our system consultants go through rigorous product training, testing and re-testing; they can answer those hard (and easy) technology questions that confuse some of the competition. When you are ready to do business with us, we want to make that easy too. We take VISA, MasterCard and the Discover Card without surcharges. We also accept American Express, Cashier's Checks & Money Orders, Personal & Company Checks (with two week clearance), and Corporate Purchase Orders (upon credit approval). FastMicro charges an easy-to-compute 3% for shipping; others forget to mention in their ads that they charge for shipping. Plus we don't charge sales tax outside of Arizona. FastMicro even ships faster than most of the competition.



So talk to one of our system consultants. Ask your tough questions, we think you'll like our answers. After all, FastMicro wants you as a customer for life, not just today.

© 1991 FastMicro, Inc. All trademarks acknowledged. Prices & specifications subject to change.

FASTMICRO

1-800-821-9000

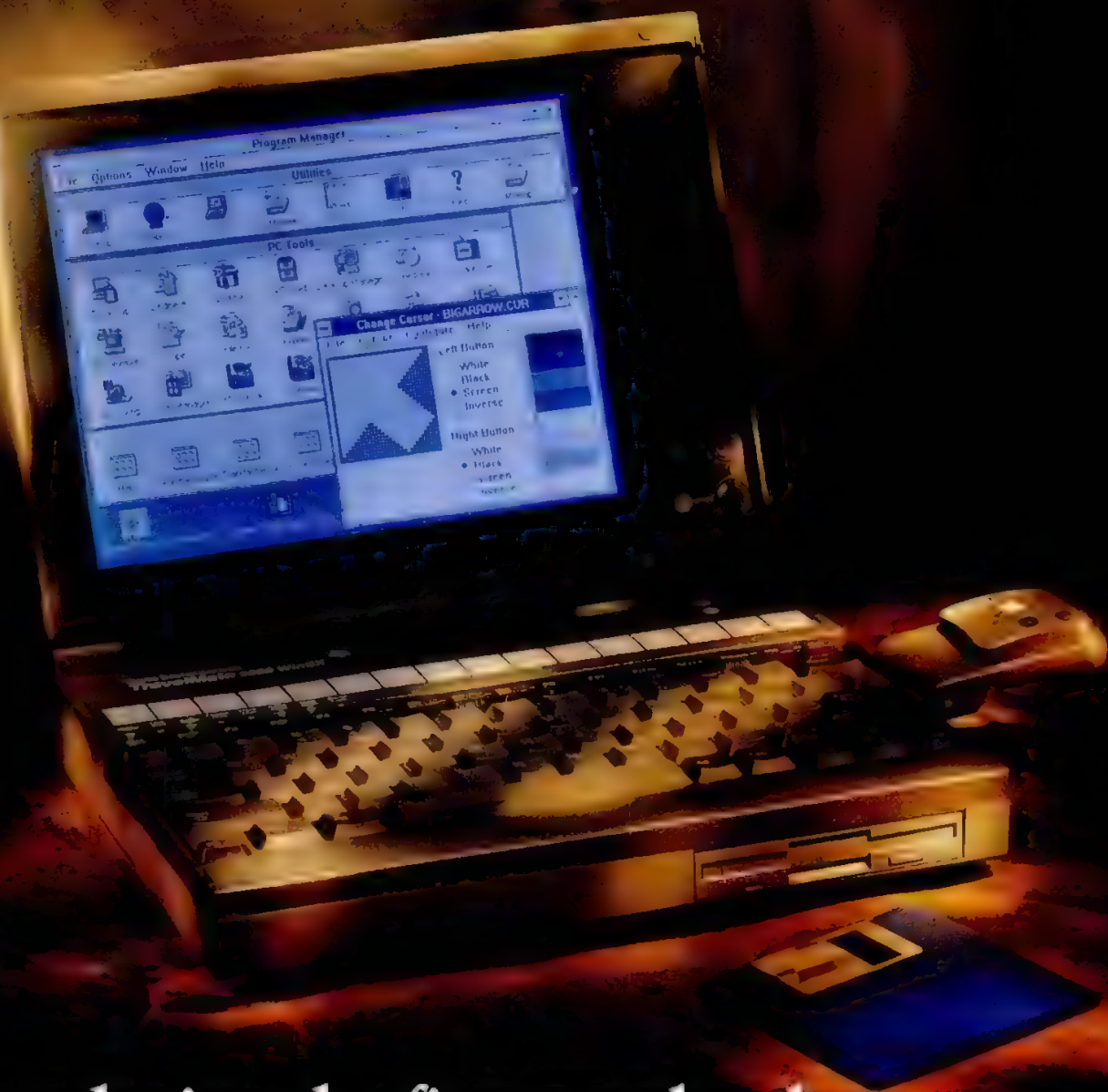
All Systems Include:

- Toll-Free Technical Assistance for Life
- 'FastSHIP' Advance Parts Replacement
- On-Site Service or System Replacement Should Unusual Problems Arise
- 30 Day Money Back Guarantee
- FastMicro Peace of Mind



FastMicro
3655 E. LaSalle St.
Phoenix, AZ 85040
(800)821-9000 (602)437-5700
(602)437-2300 FAX

CIRCLE 385 ON READER SERVICE CARD



Introducing the first notebook computer designed to make Windows™ a breeze.

Just turn it on and go. It's that simple. The new TI TravelMate™ 3000 WinSX™ package is engineered to meet the challenges of running Windows on a notebook computer. That's why it comes with MS-Windows® 3.0 and MS-DOS® 5.0 already installed on the 60MB hard drive. So within seconds, you're into Windows and ready to load your application software.

But the TM3000 WinSX offers so much

more. Like clicking in and out of applications with a specially designed pointing device. An extra-large, easy-to-see cursor that keeps your place as you move from screen to screen.

And Battery Pro™. Designed to extend battery life when working in Windows, it suspends functions you're not using while keeping calendars and other background programs current. So you can pick up

where you left off.

Best of all, these Windows features, and more yet, come in the industry's smallest, thinnest and lightest 386SX™ 20 MHz notebook computer.

Finding out more is a breeze, too. For the name of a dealer near you, call 1-800-527-3500.

 **TEXAS
INSTRUMENTS**

MS-Windows and MS-DOS are registered trademarks and Windows is a trademark of Microsoft Corporation. TravelMate, WinSX and Battery Pro are trademarks of Texas Instruments Incorporated. 386SX is a trademark of the Intel Corporation.

© 1991 TI 71853

CIRCLE 304 ON READER SERVICE CARD

Bill Machrone



Windows Bugs: Conspiracy Of Silence?

I thought I was the only one getting Unrecoverable Application Errors. Not by a long shot, as it turns out.

I'm a longtime *Windows* 3.0 user. I've praised its virtues in these pages. I've also railed against its many shortcomings: the brain-dead and performance-bereft File Manager, the absurdity of different font models for screen and printer, the limitations of Program Manager.

On Unrecoverable Application Errors (UAEs), though, I've been mute. You see, I thought I was the only one. Or that I was doing something dumb. Or that something was wrong with my hardware. In the few instances where I'd heard about excessive UAEs, the cures sounded more like witchcraft than computer science. So I posted a query on PC MagNet,

and found many others who shared my travails. My query triggered a discussion of *Windows* bugs that ran for hundreds of messages. Out of all that heat and light came some enlightenment. I'd like to share some of what I found with you.

For every person who said, "Count me as a happy and satisfied

Windows user," there were half a dozen others who refused to use the environment because of the many bugs they'd encountered. Others just chalked it up as an inconvenience.

"UAEs are so common, they don't faze me anymore," said PC MagNet sysop Scott McGrath.

"The UAEs are troubling, but you must remember that DOS (and Mac) users are accustomed to incompatibilities and periodic machine lockups," said Haig Hovanness, an MIS assistant vice president at Paine Webber. "I get a UAE a few times a week. It is irritating, but it is not a showstopper. If Microsoft can reduce the incidence of UAEs significantly in the next release of *Windows*, they should be able to avoid a market backlash."

Indeed, users seem willing to give Microsoft the benefit of the doubt. *Windows* is a complex product, and it's difficult to know exactly what's causing an error. Reader Joshua Stern said, "I have had only one UAE in six months. I've seen plenty of anomalous events when fooling with File Manager, had other

problems with SMARTDRV, EMM386, and DOS. The way *Win 3* is architected, it's gonna do these things. A fully debugged house of cards is still not very stable, so I have small hopes for 3.1. NT's separate address spaces and security features should help greatly."

"House of cards" is one of the most persuasive descriptions of *Windows*, which builds itself from dozens of files, drivers, and DLLs (dynamic link libraries). The modules interact heavily with one another, and it's impossible for the user to know whether an application error is caused by the current application or by a driver that passed it bad information. What's impossible for the user also proves difficult for Microsoft, which has put together a bug-swatting team charged with the responsibility of hunting down UAEs.

I spent the better part of a day recently with Microsoft's chief bug swatter, who came by our offices to see just how easily I could produce UAEs on a pair of Northgate 386/33s. Northgate had updated the motherboards to the newest version, but was unable to reproduce my bugs. We had pretty much ruled out hardware problems, since I'd run virtually every diagnostic program available with no



ILLUSTRATION JOE SPENCER

errors. Also, these machines are used extensively within Microsoft as well as hundreds of other corporations. We crashed just about everything in sight, including Program Manager, Solitaire, and *Windows* Write. When we ran the debugging version of *Windows*, with the second machine recording everything that happened, it was easy to see that these were real software errors, not hardware problems. Microsoft's bug swatter was almost triumphant as he took a disk full of error codes and

Discover PREMIER

PREMIER is PC Magazine's innovative resource for PC buyers. Turn to **PREMIER** for an array of dynamic companies and their exciting PC products and services. Examine state-of-the-art hardware, software and accessories, poised to become household words in the PC industry. All spotlighted at your fingertips in an easy-to-find, full color showcase. Discover it for yourself: start on page 462 and explore the world of **PREMIER**. Advertisers: To target over 800,000 PC buyers in this high impact, cost-effective section, call 1-800-825-4237



It's here...

PREMIER



Bill Machrone

stack dumps back to his office for further analysis.

WIZARDS WANTED, APPLY WITHIN

Meanwhile, I didn't have a clue how to stop these UAEs, other than resorting to witchcraft. I made one last pass through WIN.INI and SYSTEM.INI to make sure that I had all the EMMEXCLUDEs and other statements right. I reread the section of the manual on memory conflicts for the umpteenth time. The witchcraft fixes are similar in that they have little or nothing to do with Windows' operation, but are rumored to help make it more stable.

The "Simon fix," named after contributing editor and chief promulgator Barry Simon, is simply to increase DOS's environment space. I typically run with 256 bytes of environment space, double DOS's usual amount. I mentioned this to PC Magazine editor Joel Dreyfuss, who said that after speaking with Simon, he runs with 2K! Jealous as I am of memory, I compromised, raising mine to 1K.

Several readers swore that increasing the "FILES=" statement in their CONFIG.SYS to a large number helped Windows a lot. I usually run with 30 files, but one reader suggested 60. I tried 40.

A developer, Peter Eden, said, "I have spent countless hours working around serious crash bugs and deficiencies in display drivers. Some of these bugs were in the sample code that was provided to driver manufacturers, and thus, through a crude form of inheritance, are shared by all drivers 'descended' from that code."

I had been trying to keep my system as simple as possible by using the generic VGA driver. I switched to a Northgate-provided ATI Super VGA driver. I also replaced Program Manager with The Norton Desktop for Windows.

HAPPY ENDING, I HOPE

The upshot? I haven't seen a UAE in days now, and most of my tried-and-true Windows breakers no longer faze my system. Each step helped reduce the number of UAEs. Replacing the VGA driver makes sense, as does Program Manager, which is a notorious hog of system resources. No one has been able to tell me why increasing files and environment should make any difference, but clearly they do. A little witchcraft goes a long way. ■

Above Average Service, Support, Quality And Value!



Solid Reputation! Above Average Service & Support!

"The ACMA 486/33 Engineering Workstation is a fairly priced system from a vendor with a solid reputation and above-average service and support policies. Acma tied for first place in Conventional Memory tests and "...earned the second-highest score on the Instruction Mix test."



386/SX Notebook

- 1MB RAM upgradeable to 5MB
- 1.44MB floppy drive
- 20MB hard drive (40MB with 20MHz option)
- High resolution VGA display
- 1 serial & 1 parallel port
- Full-size 80-key keyboard
- Weight: 6.4 pounds with battery
- Carrying case & battery charger
- Supports external VGA monitor and keyboard
- MS-DOS 5.0 or 4.01

\$1,595



386/SX- 20

- Intel 80386/SX-20MHz CPU
- 4MB RAM expandable to 8MB
- 1.2MB & 1.44MB floppy drives
- 52MB IDE hard drive (17ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 512K RAM
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- Windows 3.0 & Mouse
- MS-DOS 5.0 or 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

\$1,595

386/25

- Intel 80386/25MHz CPU
- 4MB RAM expandable to 8MB
- 1.2MB & 1.44MB floppy drives
- 105MB IDE hard drive (17ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1024x768
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- Windows 3.0 & Mouse
- MS-DOS 5.0 or 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

\$1,895

486 EISA 25 & 33

- Intel 80486/25 or 33MHz CPU
- 4MB RAM expandable to 64MB
- 256K Cache
- 1.2MB & 1.44MB floppy drives
- 150MB ESDI hard drive (18ms)
- ESDI/EISA controller
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1024x768
- Built-in math coprocessor & Weitek 4167 support
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- Windows 3.0 & Mouse
- MS-DOS 5.0 or 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

25MHz \$4,195

33MHz \$4,395

486 ISA 25 & 33

- Intel 80486/25 or 33MHz CPU
- 4MB RAM expandable to 16MB
- 64K Cache
- 1.2MB & 1.44MB floppy drives
- 105MB IDE hard drive (17ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1025x768
- Built-in math coprocessor & Weitek 4167 support
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- Windows 3.0 & Mouse
- MS-DOS 5.0 or 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

25MHz \$2,495

33MHz \$2,595

386/33 & 40

- Intel 33MHz & AMD 40MHz CPU
- 4MB RAM expandable to: 16MB-33MHz & 32MB-40MHz
- Cache: 64K-33MHz, 128K-40MHz
- 1.2MB & 1.44MB floppy drives
- 105MB IDE hard drive (17ms)
- 14" Super VGA color monitor (1024x768, .28 dot pitch)
- 16-bit VGA card with 1MB RAM & 256 colors at 1024x768
- 2 serial, 1 parallel & 1 game port
- 101 enhanced keyboard
- Windows 3.0 & Mouse
- MS-DOS 5.0 or 4.01
- MS-DOS & OS/2, Unix, Xenix & Novell compatible

33MHz \$1,995

40MHz \$2,495



FEATURES & SERVICES

- New \$1.00 Upgrade Program!
- 45-Day Money-Back Guarantee.*
- One-Year Parts And Labor Warranty.
- Windows™ 3.0, & Mouse.**
- Microsoft® DOS 5.0 or 4.01 Preloaded!
- FREE Lifetime Toll-Free Technical Support.
- Highest Quality Name-Brand Components.
- Custom And Standard Configurations
- 1 Yr. On-Site Service (386DX & 486) Just \$45.
- Business And Personal Leasing.
- Reputation For Superior Quality, Service & Value
- Call For GSA Pricing!
- Open 9am-10pm M-F & 11am-7pm Sat.

BEST BUY!

100% Satisfaction Guaranteed!
U.S.A. & Canada 800-456-1818

International Orders: (415) 623-1212 — 24 Hour Fax Line: (415) 623-0818

COMPUTERS, INC.
Acma



The Best Quality, Service And Value!

© 1991 Acma Computers Inc., 48501 Warm Springs Blvd., Fremont, CA 94539 (510) 623-1212 (510) 623-0818 Fax. Purchase orders are subject to approval. No surcharge on Visa or Mastercard. All prices and specifications are subject to change without notice. *The 100% satisfaction/45-day money-back guarantee covers Acma brand computers only (software, printers, monitors, and shipping are not included). **Windows and Mouse not included with notebook PCs.

CIRCLE 360 ON READER SERVICE CARD

ZEOS[®] '486

Now, You can unleash ZEOS '486 EISA

THE ZEOS '486 EISA

"ZEOS...performed best on our tests, and they offer the best overall packages!"

**—PC Magazine,
Editor's Choice**

"ZEOS speeds to the head of this pack of EISA systems!"

—PC Week

"The ZEOS '486 offers the best choice of all!"

—Computer Shopper

"Outstanding!"

—PC Magazine

LOTUS/WINDOWS BUNDLE!

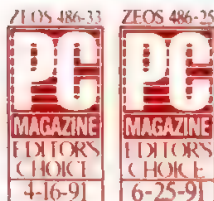
Be Sure to ask about our Lotus 1-2-3 for Windows and Ami Pro 2.0 special Windows Bundle! Included with every ZEOS Windows package!



EISA!

Power. Editor's Choice!

"A MUST FOR THE CORPORATE USER" — PC MAGAZINE



Unleash the power! Unleash your own ZEOS '486 EISA. *PC Magazine* calls it "out-standing." If it's your first '486, you will quite likely call it unbelievable. Believe it.

Attention to detail really makes the difference. We're talking about important details, items you may not even notice at first. Like two cooling fans in EVERY ZEOS '486. And cabinets Loaded with drive bays. Loaded too with 300 Watts of power and a motherboard that will take up to 32MB right on board. And more.

"SUPERLATIVE SERVICE AND SUPPORT"

"Superlative Service and Support." That's what *PC Magazine* calls ZEOS' 24 Hour a Day Toll Free Sales and Technical Support program. We're here any time you need us—day or night.

And that's only the start of your ZEOS Customer Satisfaction package. Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Parts Replacement Policy.

You're going to be very satisfied. We don't just say it. *We Guarantee It!*

ORDER YOUR ZEOS '486 EISA TODAY!

PC Magazine says the ZEOS '486 is "a must for the corporate user." Corporate or otherwise, the ZEOS *Editor's Choice* '486 EISA is the one for you. So why not pick up the phone and give us a call right now? Your own expert Systems Consultant is waiting here to help you tailor your new ZEOS '486 EISA just as you want it. Your absolute satisfaction is *Guaranteed!*

CALL NOW TOLL FREE

800-423-5891

DON'T FORGET THE OPTIONS!

ZEOS has them all. Starting with blazing 32-bit EISA cards and every other high performance option you could possibly want. On-site service is available too. Call 800-423-5891 for details.



In awarding your new ZEOS '486 the coveted *Editor's Choice Award*, *PC Magazine* said the ZEOS '486 EISA was "best on our tests." They went on to note the ZEOS '486 is "both surprisingly useable and affordable." But that really shouldn't come as a surprise. After all, this ZEOS '486 powerhouse comes from a family of *Eight* ZEOS *Editor's Choice* machines. Now let's talk real '486 power:

THE POWER OF EISA

It begins with the EISA bus. *PC Magazine* found that the 32-bit EISA bus when combined with our EISA disk caching controller will provide performance "easily twice as fast (and occasionally ten times as fast) as an AT-bus computer with the same microprocessor and megahertz rating." Now that's *fast!*

But what about compatibility? While the '486 processor offers full software compatibility, the EISA bus will accept your present eight and sixteen bit expansion cards and runs them without a hitch. That's the advantage of the EISA bus. Incredible performance with complete compatibility. That's your new ZEOS '486 EISA.

"TWEAKING AND REFINING:"

A ZEOS HALLMARK.

And, speaking of performance. In their *Editor's Choice* review, *PC Magazine* noted "ZEOS has a reputation for tweaking and refining that shows." That's the ZEOS way.

Purchase orders from Fortune 1000 companies, governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations. ZEOS and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 30 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol ZEOS

**THE COMPLETE
ZEOS '486-25MHz
EISA DESKTOP!
128K CACHE, 85MB
DRIVE & MORE.**

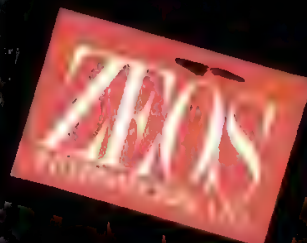
ONLY \$2995

33MHz Only \$3495

- '486-25MHz (or 33MHz) CPU with built-in Cache and Math Coprocessor.
- High Speed 128K SRAM Secondary Cache.
- 8-32 EISA expansion slots. Also accepts 8-bit and 16-bit cards.
- 1MB of High Speed DRAM, expandable to a Total of 32MB.
- Ultra Fast 85MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- Genuine Hercules® brand graphics controller. 14" High-Res Amber Display with Tilt/Swivel base.
- ZEOS/RS 101 key Space Saver Keyboard.
- ZEOS I/O Card with Two High Speed Serial plus Parallel & Game port.
- Full Weitek® math coprocessor support.
- Rugged ZEOS 7-bay desktop case with 300 Watt Power Supply and two cooling fans for increased component life and system expandability.
- Wrap it all up with 24 Hour a Day, 365 Day per year Toll Free Technical and Sales Support on your ZEOS Hotline. You've got a winner!

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders Dial: 612-633-1325
Minnesota Call: 612-633-4591
TDD (Hearing Impaired) Orders
Call: 800-228-5389
Outside US and Canada Call:
612-633-6131
MasterCard, VISA,
Discover, Am Exp.
Z-CARD and COB.
Open 24 Hours a Day,
365 Days a year!





THE SCREAMING SPEED YOU NEED

Windows Accelerators, from \$499*

Where we're going, there are no speed limits. ATI® Graphics Accelerators boost graphical applications like Windows® to escape velocity — and beyond.

PC Magazine picked our 8514-ULTRA® as their Editors' Choice among high-end graphics cards, calling it "...the fastest Windows performer." Now our new Graphics Vantage® takes its place alongside the 8514-ULTRA and the Graphics ULTRA®, as the most economical way of accelerating your PC beyond earthbound speeds.

Powered by the same Mach 8® graphics engine as the ULTRA products, the Graphics Vantage delivers resolutions from VGA® upward, and propels 800x600 and 1024x768 modes — in 256 dazzling colors — to over eleven times the

speed of Super-VGA adapters. It's like transforming your 386 into a rocket-powered 486 — instantly.

Our CRYSTAL Fonts® and flicker-free refresh rates — up to 72 Hz — clarify Windows with "near laser quality" text, readable down to 5 points even on 14" monitors. We've also equipped the Graphics Vantage with a Microsoft®-compatible mouse — and a down-to-earth price that will definitely give you no cause to scream — except perhaps with amazement.

ATI Graphics Accelerators. Because in today's world, there's no such thing as "fast enough."

GRAPHICS VANTAGE

One of the ATI Graphics Accelerators™



GRAPHICS VANTAGE



ATI TECHNOLOGIES INC.
3761 Victoria Park Avenue
Scarborough, Ontario
Canada M1W 3S2
Telephone: (416) 756-0718
User Support: (416) 756-0711
Facsimile: (416) 756-0720

Copyright © 1991 ATI Technologies. Trademarks are registered by their respective companies. *Suggested retail price, dealers may sell for less.

John C. Dvorak



Consolidation And Fragmentation

Consolidation in the software industry may spell the end of civilization (or at least innovation) as we know it!

The computer industry is following the dichotomous trends of the international community. Understanding this mania will help you relax during the next few turbulent years, I think.

Here's the duality: consolidation versus fragmentation. In one camp are the idealists of the world who think that a forced consolidation of diverse interests will produce some magical results. In the other encampment are the fragmentists.

On the international scene, the first faction is represented by the Euro '92 Common Market, structured by idealists. The influence of the other group, the fragmentists, is apparent in the political unrest in the Soviet Union, the madness in Yugoslavia, and the French Canadian separatist movement, not to mention the struggles involving the Basques, the Northern Irish, the Sikhs in India, etc., etc.

The primary trend is fragmentation. Euro '92 is an artificial attempt to make trade easier among member states. If it accomplishes that much, it will be a miracle.

Now let's jump to the computer scene. Our business is beset with consolidation mania. Most of this is led by hopeless IBM with its panicky response to competition. It's doing deals with everyone—including Apple. Meanwhile Novell has bought Digital Research, Borland has bought Ashton-Tate, and Lotus has bought Samna Corp. with its *Ami* word processor. Are any of these companies more innovative now that they've opted to become large, cumbersome bureaucratic corporations?

To exemplify the other camp takes no effort. I just hand someone a copy of *PC Magazine* or *Computer Shopper*. Take a look. These computer magazines tell us all we need to know.

First there were a few general computer magazines. Then one magazine called *80 Microcomputing* (targeted for the TRS-80 market) initiated the machine-specific concept. *PC Magazine* followed soon after, and the fragmentation dam burst.

A WORLD IN PIECES

The fragmentation goes beyond computer magazines. The number of clone makers advertising in *PC Mag* and elsewhere continues to increase. You'd think there would be some consolidation, but no. While the big companies got bigger (Compaq, Dell, Northgate, and Gateway 200 come to mind) they are pressured by more and more small-time operators. There doesn't seem to be an end in sight.

Other parts of society reflect this fragmentation. Commercial television is a perfect example. The networks are losing more and more market share as cable TV's special-interest programming nickel-and-dimes the network moguls to death. While empires aren't necessarily killed off, they hit a brick wall of slow growth, no growth, or slow death.

As far as fragmentation in the business community is concerned, the telecommunications revolution is the culprit. Being able to set up shop in Fargo, North Dakota, as easily as in New York City makes fragmentation effortless. The decentralization of distribution with the advent of trucking has fed the concept. This trend is not reversible—not as long as UPS and Federal Express trucks blanket the country.



ILLUSTRATION: JOE SPENCER

There is good reason why corporate raiders like to buy out large, bloated corporations only to sell off their assets to pay for the buy-out. Most old companies are worth more split up than whole.

The idea of a giant corporation monopolizing everything as it did during the manic 1920s is over. The bloated software companies that are starting to form may learn this lesson the hard way.

NEIL EVANS

Microsoft, MIS General Manager

Products: LAN Manager 2.0, SQL Server 1.1, Windows 3.0

Servers installed: 532 PCs, 10 VAX, 2 AS400

Workstations: 20,000 Windows workstations worldwide

Business Purposes: Marketing, finance, administration, manufacturing, distribution and office automation.



The advantages of Microsoft's client-server computing speak for themselves.

Just ask Neil Evans, Microsoft's MIS Manager. He can tell you all about the benefits of Microsoft's client-server computing. Because it's the very same software he and his staff use to oversee one of the largest global PC LANs ever assembled. The Microsoft® local area network.

"YOU GET MORE BANG FOR YOUR BUCK ON LAN MANAGER SERVERS THAN YOU DO ON THE MINICOMPUTERS. THE HARDWARE IS 4 TO 5 TO SOMETIMES 10 TIMES CHEAPER."

In 1986, it became clear to Neil and his group that there were too many limitations with the minicomputer system they were using.

When working at their PCs, people found it extremely hard to get timely access to the information they needed from the minis. And this made it difficult for them to do their jobs efficiently.

Another limitation was that the minicomputer system was too inflexible. Which meant changes were always slow and costly.

So Neil's group decided to migrate their network to Microsoft's client-server solution.

Microsoft LAN Manager and Microsoft SQL Server were integrated into the system and the Windows® environment was used on the front end.

On this platform, Neil and his group implemented 15 major client-server applications, includ-

ing systems tracking worldwide sales and management expenses. The benefits became apparent right away. LAN Manager and SQL Server are optimized to work with Windows, so individual PC stations are more completely integrated into the MIS system. It is now much easier for users to share information. People can do their jobs more efficiently. And there is much better management reporting for executive decision making.

"WITH MICROSOFT'S CLIENT-SERVER COMPUTING I CAN GET THE RIGHT INFORMATION TO THE RIGHT PEOPLE THE RIGHT WAY, RIGHT NOW."

If you'd like to find out more, we'll be happy to send you a case study explaining how Microsoft migrated to client-server computing. Just give us a call at (800) 992-3675, Department V102. Not only will we answer all your questions, we'll also speak directly to your company's interests.



Microsoft®

Inside Track

The talk of the valley for the next year (or two) will be the **Apple-IBM deal**, as people fantasize about its outcome.

Already there are signs that Apple is hedging its bet. According to sources, Apple is insisting that Motorola—the company saddled with turning IBM's RS/6000 chip set into a single chip—make the design **pin-compatible** with the 88000. This way, if Apple designs a piece of hardware to incorporate the RS/6000 and for some reason things don't work out, then Apple has a fall-back position.

The whole Apple-IBM situation is seen by some as a **Waterloo** for both companies. If IBM doesn't buy out Apple, as I suspect it might, then the whole Apple-IBM situation may become "Sculley's Albatross." If it's obvious that Apple (and IBM to some extent) is planning a **major platform change** in a year or two, then what impetus does a software developer have to continue development for the Apple 68000-based machines (or for the PS/2)?

Bogus But Fascinating Rumor Dept.: During this pretransition period—as I'll refer to the last days of the PC environment (half seriously, folks)—we'll see lots of strange alliances and unusual deals. The **hottest rumor was that Microsoft was going to jump into hardware by buying MIPS Computer Systems**—makers of the RISC chip that will go into the ACE consortium machine. Researchers who have looked into this rumor say it's untrue. It stems from the fact that Microsoft is considering a Sun maneuver and it's **itching** to design some chips. It wants a company like MIPS to act as a go-between.

Intel Keeps Moving Ahead Dept.: Supposedly Intel's **586 is running** in simulation already and the company is expected to produce some silicon as this column goes to press. Samples should be delivered by early 1992, and Home Shopping Club will be offering a 586 machine by year's end. Expect to see the **586SX** (eeeeek!) shortly thereafter!

Anyway, the 586 will be a **combination 386 and RISC processor** that will be two to three times faster than a 486. When will it end?!?!

While they light cigars with hundred dollar bills at Intel, the folks at AMD will maintain the popularity of the 386DX and the 386SX. AMD is showing a new **25-MHz version** of its SX chip. System designers tell me that current thinking in laptop design will favor the low-powered AMD chips over the special 386SL integrated chip set from Intel. "When you design around the 386SL chip set, then you are trapped with a single source," I was told. Hardware makers like to have optional suppliers whenever possible. Expect a **half-dozen**

plain-vanilla, low-power 386 chip makers in the next few years. Only Intel will make the 386SL.

Funny Story Dept.: In our modern world of technology, we can expect more wacky stories such as the one (true) story about the two clerks who changed offices for a day. Sally went to Sharon's office and figured she should transfer her calls. So she forwarded her phone to Sharon's extension. Sharon thought that Sally's idea was a good one, and since she was going to be in Sally's office, she'd do the same and forward her phone

to Sally's number. The executive who told me this story said that the infinite loop created within the phone system resulted in **bizarre and random** error messages to anyone trying to call either of the women. I found the whole thing hilarious.

The Future is Now Dept.: The name of the company is Dycam. The product is a small digital camera that takes **snapshots in the form of TIFF files** that are downloaded into the computer to be archived or manipulated. Photography, as we know it, is **dead**. Well, not quite dead, but someday. The Dycam is a great **futuristic device**. It's mainly a lens, a CCD (charge-coupled device), and a lot of memory. Right now it's only good for black-and-white TIFF files, but color is expected soon. The drawbacks are that the internal batteries can hardly hold a charge overnight, and the camera costs nearly

\$1,000. But the potential for this idea is unmistakable. Once the image is taken off the camera with the provided software, it can be **converted** to whatever format you desire with any number of available graphics packages. Dycam itself uses *HiJaack* for conversion and viewing. If you're a futurist who needs to keep up with this stuff then contact Dycam at 9588 Topanga Canyon Blvd., Chatsworth, CA 91311; 818-998-8008. Hot stuff.

Why Hasn't This Been Done Before Dept.? The company is called Tech Trade Events, and you can contact them at 5637 Ocean View Dr., Oakland, CA 94618; 415-428-2439. The company produces a **handy calendar** with all of the major (and most of the minor) computer-related events and trade shows penciled in so you can **avoid conflicts** in your personal schedule. While it sounds easy to avoid booking a party during Comdex or CES, it's harder to remember the dates of the Hannover Fair (CeBit) in Germany (if you even heard of it in the first place). Maybe you aren't going, but plenty of people will be, and you don't want to expect them to show up for your **sausage tasting and barbecue party**. The calendar costs \$29.95 plus shipping. Very handy and a must for travelers. ■

Intel's new 586
will combine a
386 and a RISC
processor that
will be two to
three times faster
than a 486. When
will it end?!?!

dFacts Are In.

DATABASE COMPARISON TABLE	dBASE IV version 1.1	Paradox version 3.5	FoxPro version 1.02
EASE OF USE			
Control Center organizes data, queries, forms, reports, labels, applications on one screen	Yes	No	No
Create applications <i>without programming</i>	Yes	Yes	No
Modern pulldown menus for all Design Tools	Yes	No	Limited
Query by Example (QBE) for easy access to information	Yes	Yes	No
Context specific help by menu item	Yes	No	No
PRODUCTIVITY			
Quick Layout for automatic forms, reports and labels	Yes	No	Yes
Application Generator for quick application development	Yes	Yes	No
Automatic code generation for all Design Tools	Yes	No	No
Automatic maintenance of multiple indexes for ordering data	Yes	No	No
Memo fields for notes, letters, descriptions	Yes	No	Yes
POWER & FLEXIBILITY			
Bold, underline, italic, subscript, superscript text for high impact reports and labels	Yes	No	No
User Defined Functions for extending programming language	Yes	No	Yes
Data input validity checking in forms	Yes	Yes	Yes
Multi-user transaction processing ensures data integrity	Yes	No	No
Number of file formats imported/exported	7	6	3
INDUSTRY STANDARDS			
#1 Selling, #1 Rated multiuser database; over 3 million users (1)(2)	Yes	No	No
Compatible with dBASE III PLUS data and applications	Yes	No	Yes
Compatible versions for DOS, VAX VMS, Macintosh, SunOS and other UNIX platforms (3)	Yes	No	Limited
Structured Query Language (SQL) integrated with programming language	Yes	No	No

(1) dBASE III PLUS and dBASE IV comprise approximately 55% of PC database systems sold (3 times nearest competitor) according to the most recent report by the market research firm Audits & Surveys (Oct. 1990). (2) Software Digest rated dBASE IV #1 among multiuser databases, October 1990. (3) Versions of dBASE IV are shipping for DOS, VAX, and SunOS. Macintosh and other UNIX Platforms are announced.

Based on what our customers tell us, we made a list of some of the most important features to look for in data management software.

Then we compared the new dBASE IV* version 1.1 with two other database products.

As you can see, dBASE IV offers exclusive advantages in

many categories.

For instance, only dBASE IV lets you access all its functions from a single screen. Called the Control Center, this screen lets you manage existing data, and create new tables, queries, reports, forms and labels totally without programming.

When all the facts are on the table, it's easy to see which database software is best.

Of course we aren't the only ones who have come to this particular conclusion.

Software Digest rates dBASE IV version 1.1 the #1 Multiuser Database (Vol. 7, No. 13, Oct. '90).

dTruth Comes Out.

Software Digest

RATINGS REPORT

Volume 7 Number 13

The Independent Comparative Ratings Report for Selecting IBM PC Business Software

MULTIUSER DATABASE PROGRAMS

Ratings Key: ■ 70-100 ■ 50-69 ■ under 5.0

Software Digest Rating	Overall Evaluation	Overall Power	Program Name	Version Tested	Performance	Reliability	Error Handling	Ease of Learning	Ease of Use	Memory Requirement	Price	Volume	Purchase Agreement	Page
***	70	6.7	dBase IV	1.1	■		■	■	■	450KB	\$795	✓	28	
**	6.8	5.1	Paradox	3.5	■		■	■	■	640KB	\$995	✓	32	
**	6.8	7.1	FoxPro/LAN	1.02	■	■				512KB	\$1,095	✓	30	
**	6.4	5.1	DataEase	4.2		■				640KB	\$750	✓	26	
*	5.8	3.6	R-Base	3.0	■					520KB	\$995	✓	34	
*	5.7	6.0	Clarion Professional Developer	2.1	■	■				512KB	\$845	✓	24	
*	5.7	6.6	Advanced Revelation	2.01		■				640KB	\$995	✓	22	

REPRODUCTION OR QUOTATION IN WHOLE OR IN PART IS PROHIBITED. WITHOUT EXPRESS WRITTEN PERMISSION.
All rights reserved. © 1990 by INSTL, Inc. Plymouth Corporate Center Plymouth Meeting, PA 19062 (800-223-7080)

Perhaps the most independent publication in the industry, *Software Digest* accepts no advertising whatsoever. Corporations pay hundreds of dollars a year to receive their monthly reviews—which are considered highly unbiased and objective. Their exhaustive, 75-page report concludes:

"Among the top ranking programs, dBASE IV (version 1.1) is the most well-rounded, with solid performance, versatility, and usability." Commenting on speed, *Software Digest* points out that "dBASE IV produces all three test reports as fast as or faster than FoxPro/LAN." As for Ease of Use and Ease of Learning, dBASE IV scored in the Excellent Range as many times as any other multiuser database product tested.

For a free evaluation kit, including competitive details and a free demo disk, call toll-free:

1-800-437-4329 ext. 1416.
 Better yet, call 1-800-2ASHTON to upgrade to the new dBASE IV now.



The truth is, no other database can do so much to improve productivity.

 Ashton-Tate



Smartcom Exec™, the newest communications software from Hayes, is remarkably easy to operate. In fact, Computer Shopper said "Many people...will be able to install and use the program without touching a book, because the interface is quite self-explanatory and help is just a function key away."

And yet, Smartcom Exec is also highly advanced. It features everything from the most popular terminal emulations and file transfer protocols to a peruse buffer and a powerful on-line text editor with many word processing capabilities.

Its handy Phone Book data base stores calling information automatically. It has mouse support for point-and-click operation. And its powerful SCOPE™ scripting language lets you write programs for repetitive tasks like unattended

operation and automatic log-ons.

What's more, PC Week said it has the best LAN support of any software they've tested.

All of which is why Smartcom Exec received PC Magazine's prestigious Editors' Choice Award, Micro Decision's Gold Award, and was named a Buyer's Choice by Computer Reseller News.

At \$129, Smartcom Exec costs much less than you'd expect. And it's even more affordable when purchased in Hayes' unique Multi-Copy software packs.

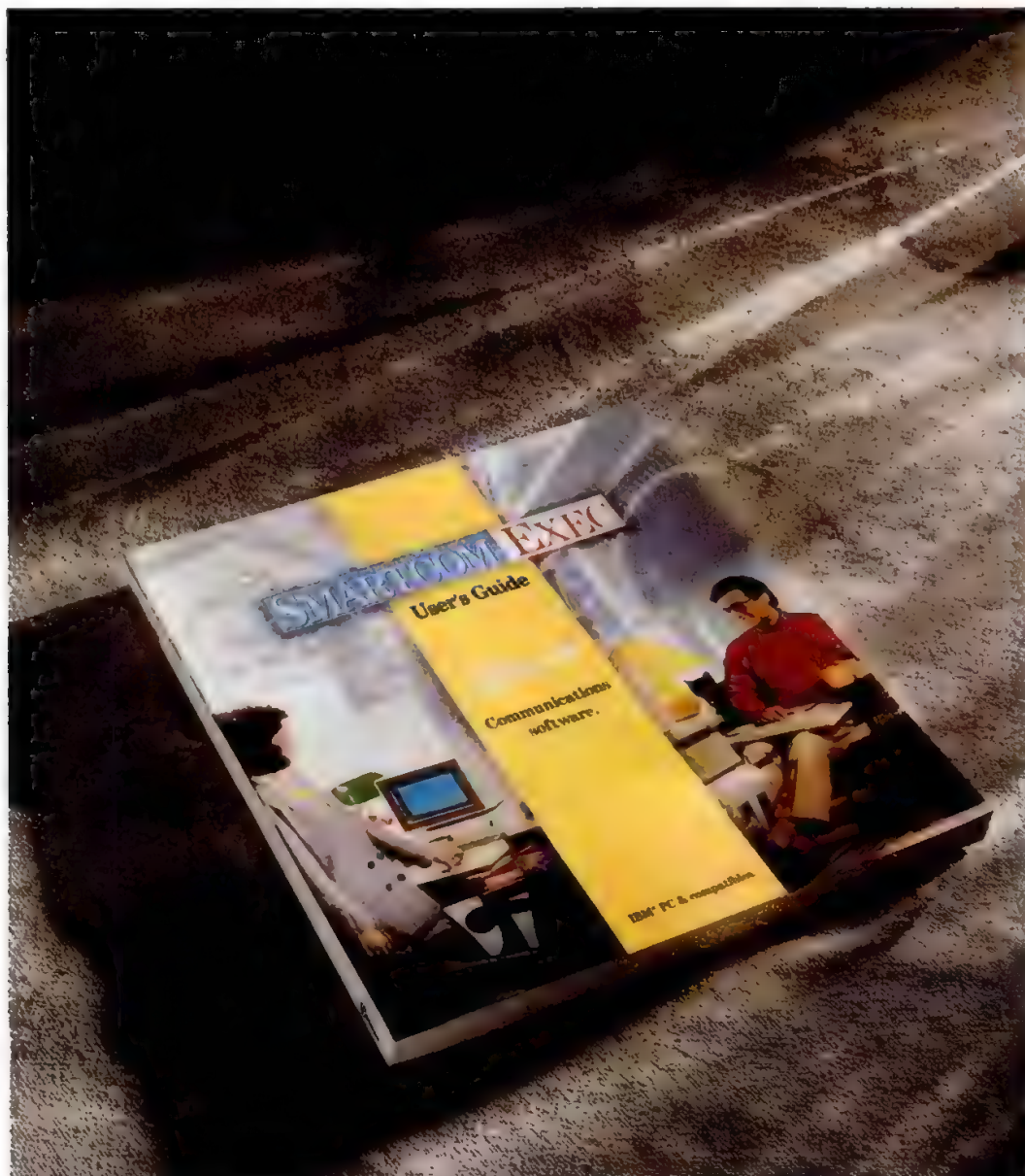
Call us at 1-800-635-1225 for our product literature which, by the way, we do encourage you to read.

Our technology has the computer world talking. More than ever.



CIRCLE 388 ON READER SERVICE CARD

While our software is a best-seller, not many have to read this book.



Jim Seymour



2001, Part II: Software That Knows Us

The software of tomorrow will expand our choices as it navigates us through the complex world around us.

Last time, I looked at some of the ideas I think will form the software we'll be using ten years from now, on the *twentieth* anniversary of the introduction of the first IBM PC.

Tomorrow's programs will be modelless, fast, smart...and huge. Well, three out of four isn't bad.

But what will we *do* with those programs? How will they be different from today's software? If all the next decade delivers is faster, bigger applications that do pretty much what today's software does, then we'll have surrendered to too-small visions of the future. Any-

one who thinks tomorrow will be just like today, "but more so," is in for big surprises.

I can answer my own question best with an example. So let me describe an application that will make a real contribution to many

of our lives—and one I fully expect to be using in the year 2001.

I want a truly comprehensive scheduling program. Not just a PIM-like appointment book, but a piece of software that keeps track of the details of my schedule—and *is smart enough to put together a lot of the work behind that schedule.*

This scheduler will have at its core a smart appointment book. It will be able to do the kinds of things we can do with schedulers today, such as setting up recurring events (squash on Thursdays at 3 P.M. or Friday afternoons with my son in the summer). But it will also be able to give me views of my schedule that are difficult and often impossible to get today.

For example: This comprehensive program will provide a list of all the appointments I have with Mr. X over the next four months. Or a list of every time I've met with someone from Company Y over the past year. Or the number of nights I've spent on the road in the last six months.

But it will go way beyond those appointment-book functions. It will actually set up and manage the details of my schedule—like

my travel arrangements, for example.

I'll be able to hotkey to a screen where I can fill in the particulars of a trip I need to make. There will be blanks for departure and return dates, destination city (or cities, in the order I want to visit them, with dates attached to each). Check boxes will let me enter preferred departure times for each leg of the trip, either in broad categories such as "morning" or "late afternoon," or by entering parameters such as DEPART AFTER ___ A.M./P.M. BUT BEFORE ___ A.M./P.M.

I'll have previously filled in reference-data forms with the myriad of preferences I have about travel: the airlines I prefer, in order of preference; the kinds of aircraft I prefer; the seat locations I prefer for each aircraft type; the class of service I usually book; the times I like to fly; frequent-flyer account numbers. And also rules such as "better to connect through O'Hare than Dallas/Fort Worth, except November through March," or "never Newark unless LaGuardia and JFK impossible."

A second reference file will include the hotels I use in cities I routinely visit, their telephone and fax numbers, and the kinds of rooms I usually book.



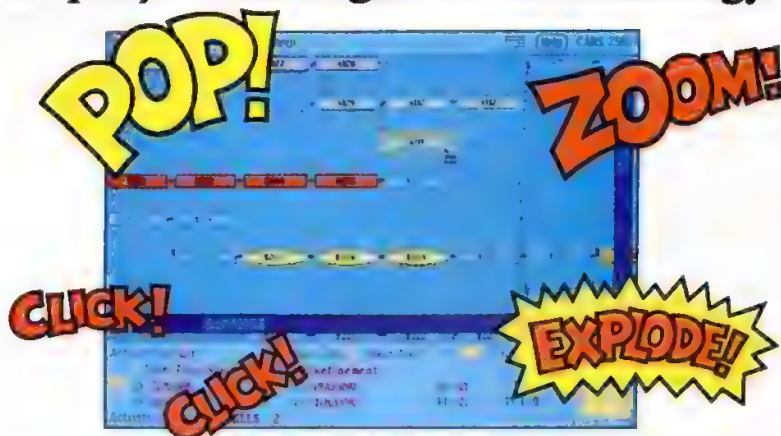
ILLUSTRATION JOE SPENCER

A third reference file will have details on car rentals: preferred companies, express accounts, cars I like and cars I refuse to drive, usual company discounts, etc.

And finally, a fourth file will include my credit-card information.

Once I've filled in the form on-screen for the trip I want to make, the software will, in the background of a multitasking operating system, set to work. It will log onto a service such as Official Airline Guide's Electronic Edition,

Primavera introduces some important new project management terminology.



Primavera Project Planner® 4.1 works like you think. Visually. Graphically. Intuitively. As quickly as "pop", "click", "zoom"! Keeping you in touch with the big picture while giving you instant access to all the details.

Create an activity? Point, click-click. Define a relationship? Two clicks and done. Updates? Double click and enter progress. P3® 4.1 gives you copy, cut and paste, group and mark, and dozens of other powerful scheduling tools.

Now, the world's best high-performance project management software is even easier to use, and offers more capability. And it's available now, running under DOS.

See Primavera Project Planner 4.1 in action. Call 1-800-423-0245 today for your **FREE** video demo.



PRIMAVERA SYSTEMS, INC.
Project Management Software

Two Bala Plaza • Bala Cynwyd, PA 19004 • (215) 667-8600 • FAX (215) 667-7894

CIRCLE 148 ON READER SERVICE CARD

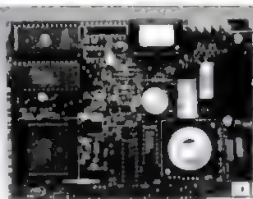
Complete Communications Solutions...

...like the ability to send faxes from Windows 3.0 with the ProModem® 24/96BFAX

Now sending faxes from any Windows application is as easy as printing with the ProModem 24/96BFAX, bundled with fax software for Windows.

MAJOR FEATURES:

- 2400 bps (V.22bis) data modem
- 9600 bps, Group III send fax
- Hayes command compatible
- Communications software also included



The ProModem 24/96BFAX - just one of the fax options available in the ProModem line of data and data/fax modems. Whatever your communication needs are, Prometheus has the solution!

Retail Price.....\$199



PROMETHEUS
PRODUCTS • INC.

(800) 477-3473 • (503) 692-9600 • Fax (503) 691-1101

CIRCLE 159 ON READER SERVICE CARD

Jim Seymour

and capture schedule information that meets my specs. It will also be smart enough to look beyond my first-choice preferences, and capture alternative schedule information.

Then it will tell me it's ready to show me my options. Each leg of the trip will be represented on-screen by a preferred-schedule line. I can check off the ones I think are okay; or if I'm not happy with one, I can hit another key that expands that line's display to the full screen, showing me the alternative flights, times, and carriers that come nearest to my preferences. I can pick any one of those with a keystroke—or grumble, and return to the program's choice.

When I've okayed the itinerary, the program will log onto an electronic reservations service or to each airline's computer, and book reservations, pick seats, and provide my frequent-flyer number.

With the flights confirmed, it will call each hotel's computer and book the rooms I want, as well as reserving a rental car at each location.

When the job is complete, it will, of course, write all the details I need—flight numbers, departure and arrival times, seat numbers, rental car and hotel reservation-confirmation numbers—into my schedule, a copy of which will be automatically printed for me weekly.

As I travel, a TRACK feature will allow my assistant to easily forward all or selected incoming faxes and e-mail as fax hard copy to the hotels on my itinerary.

There's lots more to a comprehensive scheduling system, but you get the idea: going beyond even the DWIM (do what I mean) standard I mentioned last time, to DWIND (do what I need done).

When we read descriptions of things that don't exist, they often sound fanciful, and our minds leap to all the reasons they couldn't exist. But those reasons, inevitably, are grounded in the limitations of our present vision of how things work.

I prefer George Bernard Shaw's model: dreaming of things that have never existed, and asking why not. The risk, again, is that our vision is too small, our dreams not large enough.

I expect you to hold me to this column. Write me in ten years and ask if I recall describing this program. I will—because I'll be using it every day. ■

TECHNOLOGY: IT'S ALL IN THE ATTITUDE.

Fast Modems, Fast Payback From Cardinal

We share your attitude about technology: Increased productivity and cost control are the benefits you want. Our family of modems is designed to deliver performance and value beyond expectations.

CFO

Avid Bicyclist.
Requires high speed and
quick paybacks.
Cardinal 9600 modem user.

Consider our flagship modem, the 9600V42 with V.42bis data compression. It can cut your communication bills through world-class data acceleration up to 38,400 bps over conventional phone lines. One hour of costly connect time with a standard 2400 baud modem plummets to under four minutes with the 9600V42. Now, you can replace your old modems with fast bottom-line savings from Cardinal.

Proven technology. Original designs. Superior performance.
Made in our own factory right here in the USA.
They're all part of the Cardinal attitude.

For more information about Cardinal's full line of modems, or any of our other computing products, call your local dealer or (800) 233-0187 today.

	EXT/ INT	CCITT V.42/ BIS	MNP	MAX. THROUGH- PUT (BPS)	FAX (BPS)	PRICE
9600V42	EXT	✓	✓	38,400	-	\$599
9650V32	INT	-	✓	19,200	-	\$499
2400V42	EXT	✓	✓	9600	-	\$289
2400MNP	EXT	-	✓	4800	-	\$229
2450MNP	INT	-	✓	4800	-	\$189
MB2400EX	EXT	-	opt.	4800	-	\$159
MB2450	INT	-	✓	4800	-	\$119
MB2296F	INT	-	✓	4800	9600	\$179
MB2250F	INT	-	✓	4800	4800	\$169

*Micro Channel models available.



Cardinal™

Where Originality In Technology Begins.

1827 Freedom Road, Lancaster, PA 17601
(800) 233-0187 or (717) 293-3000

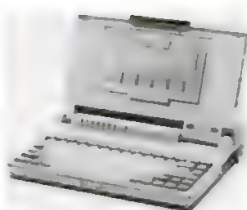
All names, products and services mentioned are the trademarks or registered trademarks of their respective organizations.

CIRCLE 319 ON READER SERVICE CARD

TELECOM

Where smart buyers find smart buys.

TOSHIBA



T1000SE

Toshiba's smallest, lightest portable PC — just 6.4 pounds

Call

BOARDS

ATI	
VGA Wonder XL 256K	\$185
VGA Wonder XL 512K	\$189
Everex	
RAM 3000 Deluxe	79
RAM 8000	175
Hercules	
Graphics Station 1 MB	635
Other Models	Call
Intel	
Above Board + 512K Plus	279
Above Board + w/2MG P/S	449
Above Board + w/2MG	
Expands to 8 MG	415
Inboard 386 PC (1MG)	485
Other Models	Call
Orchid	
Tiny Turbo 286	119
Tiny Turbo Xtra	275
Other Models	Call
Paradise	
VGA + 256K	105
VGA + 16	125
VGA 1024 512K	190
Video 7	
1024 i w/256K	125
Other Models	Call

KEYBOARDS

Keytronics	
KB5151	\$115
KB101Plus	95

CO-PROCESSORS

Cyrix	
80387 SX-16	\$109
80387-DX 20	175
Others	Call
Intel	
80387 SX-16	119
80387-DX 25	205
80387-DX 33	205
Others	Call

TOSHIBA



T3200SX

- 16 MHz 386SX microprocessor runs today's and tomorrow's software
- 40MB hard disk and 1MB RAM expandable to 13 MB

Call

TERMINALS

Wyse	
30+	\$280
50	359
60	285
150	269
160	335
185	349

TAPE BACKUP

Colorado Memory System	
Jumbo 120/250	295
Jumbo 60/120 INT	239
Irwin	
40 MG Internal	235
80 MG Internal	320

TOSHIBA



T2000SX

- 80386™SX, running at 16MHz
- Built-in dedicated modem slot (Toshiba "D" type)

Call

DISKETTES AND TAPES

Sony	
3.5 D/S D/D (100)	\$70
3.5 H/D (100)	130
5.25 D/S D/D Disks (100)	50
5.25 High Density (100)	87
Sony Tape	
150 MB/5.25	20
20-40 MB/3.5	15
60 MB/5.25	19

HARD CARDS

Plus Development	
II XL50 MB	\$375
II XL105 MB	\$599
II 80 MB	489
Other Models	Call

TOSHIBA



T1200XE

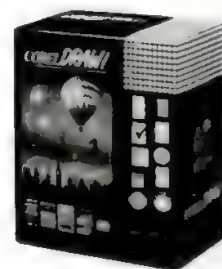
- 80C286, running at 12MHz
- Full-function, standard key-spaced, 82-key sculptured keyboard

Call

BEST SELECTION

We have the product you want.

CORELDRAW!



"The World's Finest PC Illustration Software" **\$359**

OCR/SCANNERS HARDWARE

Complete	
400 Hand Scan	\$145
Full Page GS	\$529
Half Page 400 DPI	175
DFI	
Scanner HS-3000+	145
Logitech	
Logi Scanman 256 for PS/2	339
Logi Scanman 256	282

SOFTWARE

CAT Reader Pro 1/2 Page	\$155
CAT Reader Pro Full Page	225
Complete OCR/FP	289
Complete OCR/HP + 400	175
DFI OCR Deluxe	90

MOST RELIABLE

10 Years of Mail Order Excellence.

MICE

Kensington Expert Mouse Bus	\$110
Kensington Expert Mouse PS/2/SER	95
Logitech Mouseman Bus Right Handed	66
Logitech Mouseman Serial Right Handed	\$59
Logitech Mouseman Serial Cordless	105
Logitech Trackman Bus	81
Logitech Trackman Serial	75
Logitech Trackman Portable	93
MS Ballpoint Mouse	110
MS Bus or Serial Mouse 1.0	95
MS Bus or Serial w/Windows 3.0	142
Microspeed PC Trac Bus	82
Microspeed PC Trac Ser or PS/2	70
Mousepen Pro - PC	61
Omni Mouse II Bus	48
Omni Mouse II Serial	37
PC Trac Ball Serial	45
PC Trac Ball Bus	56

WRITING TOOLS GROUP

Correct Grammar
For Windows



The only sentence checker that works within ALL Windows applications.

\$48

PRINTERS

LASER

Canon	
LBP-4 Laser	\$789
Epson	
7000 Laser	835
7500 Laser	1995
Hewlett Packard	
Laser Jet IIP	849
Laser Jet IIP	1575
Laser Jet III P	1079
IBM	
LaserPrinter (5 ppm)	919
LaserPrinter (10 ppm)	1419
NEC Silentwriter II Model 90	1539
Okidata	
OL-400 Par	629
OL-800	949
OL-820	1229
OL-840	1659
Panasonic	
4420 Laser	845
Texas Instruments	
Micro Laser Postscript 17 Font	1209
Micro Laser Postscript 35 Font	1519
Toshiba	
All Models	Call

DOT MATRIX

Citizen Printer	
200GX	\$159
200GX-15	295
GSX 130	245
GSX 140 +	299
GSX 140/80	265
HSP 500	310
Other Models	Call
Epson	
FX 850	299
LQ200	235
LQ570	269
LQ870	459
LQ1170	629
LX810	159
Other Models	Call
IBM	
Pro Printer II XL	339
NEC	
P3200	269
P3300	379
P6300	635
P9300	885
Okidata	
182 Turbo	225
320 ML Par	315
321 ML Par	445
390 Plus	445
391 Plus	599
393 Plus Color	1009
Other Models	Call
Panasonic	
1123	225
1124i	295
1180	155
1624	369
1695	375
Other Models	Call
Star Micronics	
NX 1001	145
NX 1020 Rainbow	189
NX 1500	289
NX 2420 Rainbow	275
Other Models	Call
OTHER	
Canon BJ-10EX	\$335
Diconix 150 Plus	335
Seiko Smart Label + Printer	165

SOUND BOARDS

Creative Labs	
Sound Blaster	\$145
Sound Blaster Midi KR	49
Ad Lib	
Music Synthesizer Card	109



SHIPPING MOST ORDERS SHIPPED IN 24 HOURS



PRICE
A DECADE
OF THE
LOWEST PRICES



CONFIDENCE
WE DO NOT CHARGE
YOUR CREDIT CARD UNTIL
YOUR ORDER IS SHIPPED



CONVENIENCE
EXTENDED HOURS
LATE NIGHTS, SATURDAYS
AND SUNDAYS

**Telemart Carries Much More Than Our Ad Can Hold!
If You Don't See What You're Looking For, Call Us!**

COMPUTERS DESKTOP

ALR	
Business Veisa 386/33 #101	\$1619
Power Flex 286/40MG	909
AST All Models	Call
Compaq	
386 20E Model 1/3.5 DR	2495
386 20E Model 60/3.5 DR	4009
386S Model 1/3.5 DR	1869
IBM	
Model 30/286-E01	1389
Model 30/286-E21	1639
Model 30/286-E31	1749
Model 55SX-061	1909

LAPTOP

Epson	
Equity Portable LT-286e	\$2220
Equity Portable LT-386sx	2619
Leading Edge LT386+	1639
Sharp PC-5541	3069
Toshiba	
T-1000 SE	835
T-1000 XE	1189
T-1200 XE	1669
Other Models	Call

NOTEBOOK

ALR Venture16 386SX 16 mhz 20MB	\$2365
Altima NSX386SX 20MB	2545
AST Exec 386SX 40MB	2689
Epson NB3-S 20mb	2799
Epson NB3-S 40mb	3069
Everex Tempo XL 20mb	2299
Packard Bell 286 NB 12 mhz 20 MB	1549
Panasonic CF-170	1495
Panasonic CF-270	1989
Panasonic CF-370	3239
Poquet Hand Held	935
Texas Instruments 2000 20MB	1885
Texas Instruments 3000 20MB	2535
Texas Instruments 3000 40MB	3009
Sharp Wizard 02-8000	Call

MIT SYSTEMS

286-16 40MB 1MG w/DOS	Call
386SX-16 40MB 1MG w/DOS	Call
386-25 80MG 2MB N/C	Call
386-33 /64K cache 4MB 105 MG	Call
486-25/128K cache 4MB 210 MG w/dos	Call
512K VGA Card	Call
Tape Backup 120 MG	Call

COMMUNICATION HARDWARE

ATI	
2400 ETC INT w/SW	\$129
2400 ETC EXT	149
Cardinal	
2400 INT w/MNPS	115
MB 2400 INT	55
Complete	
4800	109
9600	235
Communicator	295
PC Portable Fax	295
Everex	
Evercom 12 INT	49
Evercom 24 INT w/MNP	65
Everfax24/96 INT	255
Other Models	Call
Hayes	
1200 B	135
2400 B	225
2400 EXT	319
9600V Series EXT	485
Other Models	Call
Intel	
2400 B Classic	139
2400 EXT	165
2400 PS/2	219
Satisfaction Classic	375
Practical Peripheral	
2400 B	120
2400 INT w/MNP	159
2400 SA	195
9600 SA	449
Pocket Modem	105
Other Models	Call
ProMatheus	
1200 B w/Software	49
2400 B w/Software	99
2400G EXT	145
Pro Modem 9600 + EXT	695
Other Models	Call
U.S. Robotics	
Courier 2400 EXT	265
Courier 2400 E(MNP)	315
Courier Dual Standard EXT	825
Courier HST/PC INT 14.4	565
Courier HST 14.4 EXT	575
Zoom	
2400 EXT V.42 Bis	149
2400 EXT	70
2400 EXT w/4800 fax	79
2400 EXT w/9600 fax	85
2400 INT w/9600 Send/Rec	109

MONITORS

Amdex	
All Models	Call
Amazing	
12" MM 1288	75
14 MM 1488	99
14" CM 8484 EX	315
Mitsubishi	
XC 1410 C EGA	269
XC 1429 C VGA	385
Other Models	Call
NEC	
Multisync 2A	405
Multisync 3DS 14"	595
Multisync 4DS	959
Multisync 5D	2269
Multisync GS-2A	169
Princeton	
Princeton Ultra 1400	509
All Models	Call
Sony	
Multiscan 1304 HG 14"	609
Zenith	
ZCM 1492	599

CD ROM

NEC	
CD ROM INT CDR-36 XT/AT w/int	\$499
CD ROM EXT CDR-73	699
CD ROM INT CDR-83	635
Panasonic	
Worm 940 MB	2199
Sony	
CD ROM INT	419
CD ROM EXT	479
Toshiba	
CD ROM RDR w/SCSI EXT	639

DISK DRIVES

Iomaga (Bernoulli)	
Beta 44 MGTransportable	\$869
Beta 88 MG Dual 44	1655
Beta 44 MG Insider	775
180 MB Dual 90 5.25 EXT	1549
Other Models	Call
Maxtor	
7080 80MG IDE w/CNT	315
LXT 213A 200MG IDE w/CNT	629
Seagate	
ST1102A 89 MG	295
ST1144A 124 MG	375
ST1239A 211 MG	805
Other Models	Call
Teac	
3.5" 1.44 MG AT	59
5.25" 1.2 MG AT	59
Toshiba	
3.5 1.4 MG	65



1-800-521-1973

NOW ACCEPTING INTERNATIONAL ORDERS - Call our FAX at (602) 944-1510

VARs/Dealers - Call 1-800-537-6753

CORPORATE ACCOUNTS - Call 1-800-752-0561

CIRCLE 206 ON READER SERVICE CARD

PCM102991

BUYERS CHOICE



When you see the ☎ symbol, you're assured these products have been purchased most often by **telemart**'s national customer base.

All these products have been top ranked because you, the buyer, have selected them based on their performance and the **telemart** price.

You'll see the ☎ symbol in each category and know you can make the same smart choice.

GRAPHICS

PC Paintbrush IV	56
PC Paintbrush IV Plus	☎ 109
Printmaster Plus	32

PROGRAMMING & LANGUAGES

MS Basic Pro Development System	\$293
MS C Compiler	293
MS Cobol Compiler	534
MS Fortran Compiler	266
MS Macro Assembler	89
MS Pascal Compiler	178
MS Quick Pascal	59
MS Quick Basic	☎ 59
MS Quick C	59
MS Visual Basic	119
Turbo C + +	64
Turbo Pascal Pro 6.0	185

COMMUNICATIONS

Carbon Copy Plus 6.0	\$110
Carbon Copy Plus Host	190
CompuServe Membership Kit DOS	19
Crosstalk XVI	112
Crosstalk Mark4	132
Mirror III 2.0	79
Procom Plus v2.0	☎ 62
Prodigy Start-Up Kit 3.1	25
Remote 2 Complete Pkg.	105

TIME MANAGEMENT

Act! v2.0	☎ \$215
Calendar Creator Plus	48
Quick Schedule Plus	59
Top Priority	49
Working Hours	59

INTEGRATED SOFTWARE

Lotus Symphony 2.2	\$465
MS Works	89
PFS First Choice	☎ 89
SmartWare II w/Spell Chkr	429

telemart

EXTENDED HOURS

Mon.-Fri. 6:00 am-10:00 pm MST

Sat. 8:00 am-5:00 pm MST

Sun. 10:00 am-3:00 pm PST

Do A Little Windows Shopping With

telemart

Adobe Illustrator Windows	\$305
Adobe Streamline Windows	119
Adobe Type Manager Windows	59
After Dark	27
Ami Professional	279
Asymetrix Toolbook	279
Becker Tools	72
Borland C++	310
Charisma	320
Corel Draw 2.0	359
Crosstalk for Windows	115
Current by IBM	199
Designer	492
Drafix Ultra Windows	407
Facelift for Windows	59
Facelift for Windows ValuePak	117
Form Base w/Windows	295
Form Publisher	132
Grammatik for Windows	55
hDC FileApps for Windows	69
hDC FirstApps for Windows	53
hDC ICON Designer	32
hDC Windows Express	49

Lotus 1-2-3 for Windows	\$399
MS Entertainment Pack	24
MS Excel for Windows	293
MS PowerPoint for Windows	293
MS Productivity Pack	36
MS Project for Windows	412
MS Word for Windows	293
Norton Desktop	95
Norton Backup	82
Objectvision	87
Omni Page 386	432
PC-Kwik Power Pak v.2.0	69
PageMaker 4.0	479
PerFORM Pro	299
PFS Professional Write Plus	129
Read Write Windows	315
Superbase 4	409
Ventura Publisher Gold/Windows	469
WinConnect	59
WINFAX Pro	70
WordPerfect for Windows	269
Wordscan 286/386	385
Wordscan + 286/386	649

WE ACCEPT INTERNATIONAL ORDERS AND CORPORATE PURCHASE ORDERS

PRESENTATION GRAPHICS

Animator	\$285
Corel Draw 2.0	☎ 359
Drafix Ultra v4.0	232
Harvard Graphics 3.0	325
Lotus Freelance Graphics 4.0	309

SPREADSHEET

Lotus 1-2-3 Ver. 2.3	☎ \$325
Lotus 1-2-3 Ver. 3.1	399
Lotus 1-2-3 Ver. 3.1 Live Upgrade	105
Lucid 3-D v2.2	53
MS Multiplan	116
Plan Perfect 5.1	225
Quattro	65
Quattro Pro	309
Supercalc 5	89

PROJECT MANAGEMENT

Harvard Project Mgr III	\$425
Lotus Agenda 2.0	269
Org + Advanced	59
Timeline 4.0	☎ 435

DATA BASE MANAGEMENT

Ask Sam v5.0	\$211
Biz Base	38
Clarion	
Personal Developer	43
Professional Developer	449
Clipper 5.0	499
Data Perfect	279
Dbase III Plus	429
Dbase IV	449
dBaseXL	129
Foxbase Plus 386	269
Foxbase Plus Single User	182
FoxPro Single User 2.0	455
Paradox 3.5	495
Personal R-Base	92
Q&A	☎ 249
R-Base 3.1	455
Revelation Advanced	699
R&R Relational Report Writer	145

Fonts

Adobe Type Manager	\$59
Glyphix Fonts	
WordPerfect	68
MS Word	68

LAN & NETWORKING

SOFTWARE

Above LAN	\$235
ACCPAC BPI LAN	230
Data Ease LAN 3-Pak	509
Dbase IV Lan	609
Direct Access Network Server	355
Foxbase Plus LAN	269
FoxPro Lan 2.0	739
Harvard Graphics LAN Server	408
MS Excel Exec License Pack	234
MS Word License Pack	174
Paradox 3.5 LAN	195
PC Anywhere IV LAN	266
Q & A Network Pack	319
R-Base LAN 3.1	579

HARDWARE

Anthem	
NE1000	\$149
NE2000 w/o cable	159
Artisoft	
Lantastic 2MBPS Starter	330
Lantastic Ethernet Starter	459
Standard Microsystems	
All Other Models	Call
Tiara	
All Other Models	Call

UTILITIES

BACK UP

Back It 4	\$72
Central Point Backup	75
Fastback Plus 3.0	109
Norton Backup	☎ 93

GENERAL

Check It! 3.0	\$79
Copy II Option Board Deluxe	☎ 106
Copy II PC 6.0	23
Mace Vaccine v3.0	59
Norton Editor	65
PC-Kwik Power Pak v2.0	69
SPF/PC	143
Super PC-Kwik	43

HARD DISK MANAGEMENT

Disk Optimizer	\$30
Fastrax v4.0	47
Lotus Magellan	94
Mace Utilities 1990	89
Norton Utilities 6.0	91
Optune	42
PC Tools Deluxe 7.0	96
QDOS III	41
SpinRite II	60
XTree Gold 2.0	☎ 89

LAPTOP

Battery Watch Pro	\$27
Brooklyn Bridge	82
Desklink	96
Laplink Pro	☎ 85
Software Bridge	70
VGA Dimmer	25

MEMORY MANAGEMENT

386 Max 5.1 Windows	\$59
Above Disk + 4.0	55
Headroom	56
Memory Mate	39
Move 'Em	45
Qemm 386	☎ 58
Qram	48

MENUING SOFTWARE

1 Dir Plus v.3.5	\$45
Auto Menu	35
Direct Access	☎ 59
Power Menu	60

PRINT

Go Script	\$88
Go Script Plus	175
Impress 2:L	69
Print Q v5.0	79
Sideways v.3.3	☎ 54

SCREEN SAVERS

After Dark	27
Intermission	27

MONEY BACK GUARANTEE

Software Only - See Details.*

FORM PROCESSING

Form Filler 3.0	\$79
Formtool Gold 3.0	☎ 53
Formworks w/Fill & File	79
PerFORM Filler	76
PerFORM 2.1	88

1-800-521-1973

NOW ACCEPTING INTERNATIONAL ORDERS - Call our FAX at (602) 944-1510

VARs/Dealers - Call 1-800-537-6753

CORPORATE ACCOUNTS - Call 1-800-752-0561



• We Charge for VISA and MasterCard.
• We Do Not Charge Your Card Until Your Item is Shipped.
• You Pay The Ground Shipping 1-10 # \$8.00; 11-20 # \$12.00 (Except Alaska & Hawaii). We Pay the Air Difference and Free Air Applies ONLY to Domestic Orders Over \$100. (Up to 20 lbs.)
• Now accepting International Orders. Call our FAX at (602) 944-1510.
• International Orders Add 5%.
• Call Before Submitting P.O.'s. Ask for Minimum Amount.

• All products including D.O.A.'s carry only manufacturer's warranties. We do not honor guarantees, rebates, trial period privileges or promotional programs offered by manufacturers.
• No returns on used or misordered product.
• We do not guarantee machine compatibility.
• Machine compatibility disclaimer does not apply to IBM Systems.
• Personal & company checks will delay shipping 3 weeks.
• Prices, terms, availability & specifications are subject to change without notice.
• Add 5% for C.O.D., A.P.O. & F.P.O. Orders.

• Mailing Address:
telemart
8804 N. 23rd Ave. Phoenix, AZ 85021
• In Arizona Call (602) 944-0402.
• Order Line Hours: Mon-Fri 9am-10pm, Sat 9am-5pm, Sun 10am-3pm
• Order Processing: (602) 944-1857 10am-3pm Mon-Fri
• Money Back Guarantee
30 Days from date of invoice. Refund ONLY on Product Price. Product must be in resalable condition. Call for Return Authorization Number. Must be in original packaging. Software is the latest available version.

PCM102991

OKIDATA



182 Turbo

- 180 cps Super Speed Draft
- 120 cps Utility
- 30 cps NLQ

\$225

PERSONAL FINANCE

Money Matters v2.0	\$36
Quicken 4.0	35
Quickpay	30
Tobias Managing Your Money v.7.0	119
Wealth Builder	90
Wealth Starter	33

CAD & ENGINEERING

Auto Sketch 3.0	\$141
Design CAD 3-D	189
Generic CAD 5.0	279
Generic CAD Starter Kit Level II	85
Math CAD	299
Summasketch 12x12 II	329
Summasketch 12x18 Pro II	
4 Button	580
Summasketch 12x18 Pro II	
16 Button	595
Turbo Cadd	76

LIST MANAGEMENT

Address Book Plus	\$49
Avery Label Pro (Laser or Dot Matrix)	45
Avery List & Mail	28
Avery List & Mail Plus	35
Labels Unlimited	49

telemart

EXTENDED HOURS

Mon.-Fri. 6:00 am-10:00 pm MST
Sat. 8:00 am-5:00 pm MST
Sun. 10:00 am-3:00 pm PST

Broderbund



"Life, Liberty and the Pursuit of Carmen Sandiego."

\$35

OPERATING ENVIRONMENTS

Carousel v5.0	\$53
Desqview 386 v.2.3	129
MS Windows Ver. 3.0	88

HOME OFFICE PUBLISHING

Express Publisher v2.0	\$95
Finesse	95
Newsmaster II	44
Newsroom Pro	24
PFS First Publisher	91
New Print Shop	35
Publish It! v2.0 w/Design	130

OKIDATA



The Okidata® OL400

- Industry's best warranty: 5 years on printhead, 1 year parts/labor on printer.
- Slim, low-profile design fits any desktop



\$629

PROFESSIONAL DESKTOP PUBLISHING

AMI Pro	\$279
Freedom of Press	235
Pagemaker 4.0	479
Ventura Pub Gold/GEM	469

DOS

Dr. DOS v5.0	\$129
MS DOS 4.01	69
MS DOS 5.0 Upgrade	59
MS DOS 5.0 OEM	79

OKIDATA



393 Plus

- "Workhorse" of letter quality printers (24-pins)
- Fastest in its class — with 4 speeds — up to 520 cps

\$949

WORD PROCESSORS

LetterPerfect	\$129
MS Word 5.5	203
PC Outline	60
Right Writer 4.0	53
WordPerfect 5.1	239
WordPerfect Office	82
WordPerfect Rhymor	46
Wordstar 6.0	195
Volkswriter 4	139

NOVELL

NetWare 3.11

100 USER

Call



10BASE-T LANCARD AT

\$209

ACCOUNTING

ACCPAC BPI	
AP, AR, GA, INV Payroll	\$235
ACCPAC Bedford Accounting	117
ACCPAC Simply Accounting	117
DAC Easy Accounting 4.1	79
DAC Easy Bonus Pack 4.1	122
DAC Easy Payroll 4.1	53
One Write + Acctg. System	167
One Write + Payroll	60
Peachtree III	142
Peachtree III w/Data Query	210
TimeSlips III 4.0	185

LOWEST PRICES

Industry Price Leader.

ACCESSORIES

Masterpiece	\$82
Masterpiece Plus	95
Masterpiece Remote	102

FONT CARTRIDGES

Pacific Data 25 IN 1 III	\$259
Pacific Data Page PE	349
Pacific Data 4 Memory 2 MB	139

FREE

FASTEST DELIVERY



FEDERAL EXPRESS

You Pay The Ground Shipping
We Pay The Air Difference

OKIDATA



320

- 63 cps NLQ, 250 cps Utility and 300 cps High Speed Draft
- Superior paper handling with 5-part forms capability

\$315

Where smart buyers find smart buys.

telemart

Project Scheduler 5™

The #1 power planner
the competition
didn't plan on.



REPORT CARD							
WORLD							
Mainstream Project Management Software							
	(InfoWorld weightings)	Harvard Project Manager Version 3.02	Instaplan 5000 Version 2.0	Microsoft Project for Windows Version 1.0	Project Scheduler 5 Version 1.0	Superproject Expert Version 1.1	Time Line Version 4.0
Price		\$695	\$549	\$695	\$695	\$695	\$695
Performance							
Features and flexibility	(175)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Rescheduling/resource leveling	(100)	Satisfactory	Satisfactory	Good	Excellent	Very Good	Very Good
Speed	(75)	Satisfactory	Very Good	Excellent	Very Good	Very Good	Satisfactory
Reporting	(100)	Good	Good	Good	Very Good	Very Good	Very Good
Documentation	(75)	Very Good	Good	Very Good	Very Good	Good	Very Good
Ease of learning	(100)	Very Good	Very Good	Very Good	Very Good	Good	Very Good
Ease of use	(125)	Good	Good	Very Good	Excellent	Good	Good
Error handling	(75)	Good	Good	Satisfactory	Very Good	Good	Very Good
Support							
Support policies	(50)	Good	Good	Very Good	Good	Good	Very Good
Technical support	(50)	Very Good	Very Good	Satisfactory	Excellent	Satisfactory	Very Good
Value	(75)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Final scores		6.0	6.4	7.1	8.7	6.8	7.1

Source: InfoWorld, November 26, 1990

See how Project Scheduler 5
fits into your plans. Call or write:

415/570-7700

393 Vintage Park Drive, Suite 140
Foster City, CA 94404

 **Scitor**
Corporation

William F. Zachmann



This Means War...

For a while, IBM and Microsoft seemed to kiss and make up. But the gloves have definitely come off.

By the start of 1991 it appeared that Microsoft and IBM had at least partially resolved their differences over OS/2 and *Windows*. Press accounts of a "divorce" between IBM and Microsoft and of the "death" of OS/2 were vigorously denied by both parties. They concluded greatly expanded cross-licensing agreements last September, and shortly thereafter Microsoft released a software migration kit (SMK) to help developers port *Windows* applications to OS/2 PM. In addition, Microsoft strongly reaffirmed a commitment to provide a binary compatibility layer (BCL) to run *Windows* applications directly on OS/2.

Commenting on all that at the time, (January 29, 1991) I wrote: "The result is that users are now free to use *Windows* and OS/2 in whatever combination is most appropriate to their needs, confident that both IBM and Microsoft are committed long-term to support their choices. That is not only good for users, but good for *Windows* and OS/2, as well."

Unfortunately, I was wrong. I still believe that the assurances from Microsoft and IBM at the time were honest and well meant, but there is no denying that Microsoft and IBM aren't merely "divorced" today—they are at war. The attempted gentlemen's "agreement to disagree" (embodied in the expanded cross-licensing agreements) completely fell apart early this year. What started as a difference of opinion escalated through growing levels of mutual mistrust and suspicion into what amounted, by the middle of the year, to overt hostilities between Microsoft and IBM. Barring a surprising—and by now most unlikely—reconciliation between the two, IBM and Microsoft are locked into a zero sum game where each seeks victory at the expense of the other. As a direct result, what ought to have been a complementary relationship between *Windows* and OS/2 has become an increasingly uncompromising "us or them" choice demanded of users by both Microsoft and IBM.

Microsoft was already promoting *Windows* and the future 32-bit *Windows* API at the expense of OS/2 and the OS/2 Presentation Manager (PM) API before IBM finally "took the gloves off" last April and explicitly made OS/2 PM a competitive alternative to *Win-*

dows—attacking *Windows* in the process. Had the U.S. and the Soviet Union escalated their differences the way IBM and Microsoft did theirs over the past year, World War III would have taken place years ago.

IBM's path for the future remains what it has been since 1987: migration from DOS to OS/2. Some of the details, however, have changed. IBM no longer seems bent on trying to derive proprietary advantage via OS/2 Extended Edition or linkage between OS/2 and IBM's Micro Channel architecture. IBM seems to have learned from its past mistakes there.

IBM has also recognized that migration to OS/2 won't happen if users are required to give up anything they've already got. That led to an intense effort to ensure that OS/2 2.0 will run not only DOS but also *Windows* applications as well—in addition to being a platform for new applications based on OS/2 and PM.

Microsoft, on the other hand, has all but completely disavowed OS/2. OS/2 may not be dead, but at this point there seems to be little doubt that Microsoft prefers that it die. Microsoft plans to introduce (hopefully by year's end) a significantly improved version of *Windows* for DOS (*Windows* 3.1). The future,



however, belongs to what Microsoft now calls "*Windows* NT mode," an enhanced 32-bit version of *Windows* and the *Windows* API to replace the earlier 16-bit versions.

The bottom line is that IBM and Microsoft now promote two competing, mutually exclusive visions of what developers and users ought to do. In the next issue, we'll take a closer look at Microsoft's version of a future owned by the NT kernel, and IBM's parallel—but separate—aspirations for OS/2. ■



BUY THE ONLY FULL PAGE COLOR DISPLAY, AND ...

NOW FOR \$1249 you can own the only color portrait display for the PC. Introducing the Radius Full Page Pivot, the display that shows you an entire page at one time. Pivot displays 65% more information than standard 12" or 13" monitors, so you can see a letter or full page layout from top to bottom. Image quality is superb—anywhere from VGA resolution all the way up to 1024 x 768. ● You can also



rotate Pivot into landscape mode to view a complete spreadsheet. Pivot combines with the advanced Radius SVGA MultiView Interface for real-time pivoting. When given a gentle turn, Pivot automatically reorganizes your application, so you can quickly and gracefully go from one orientation to the other. ● In addition, Pivot with MultiView provides 100% VGA and SVGA compatibility,





TURN IT INTO A SPREADSHEET DISPLAY FOR FREE.

offers high resolution full-page drivers for Windows 3.0, WordPerfect, Lotus 1-2-3, AutoCAD and others, displays up to 32,768 colors and meets the Swedish standards for low ELF/VLF magnetic emissions. We might also mention that MultiView—the fastest SVGA card you can buy today—works with a variety of multi-frequency displays, sells for \$449 and comes with a sev-

en-year warranty. ● If the combination of Full Page Pivot and SVGA MultiView sounds like the perfect display system for all your applications, it's probably because it is. Pivot and MultiView are available from Radius, the leading manufacturer of high resolution graphics systems for personal computers. To find your nearby Radius reseller or to receive a Full Page Pivot video tape, call 1-800-227-2795.

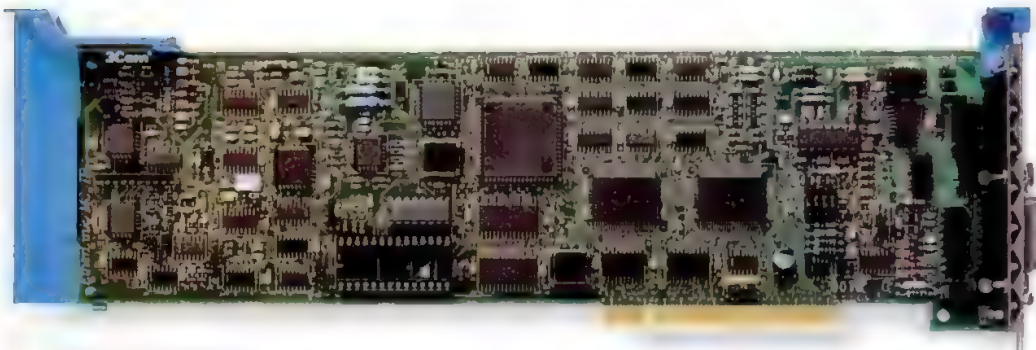


CIRCLE 234 ON READER SERVICE CARD

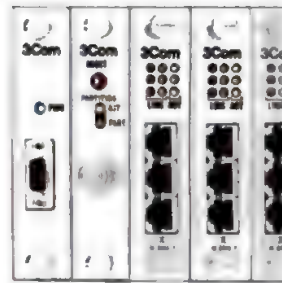
of their respective owners. For the name of your Radius International Distributor, call 408 434 1010. Screen image courtesy of Don Baars' Excel Team.

radius

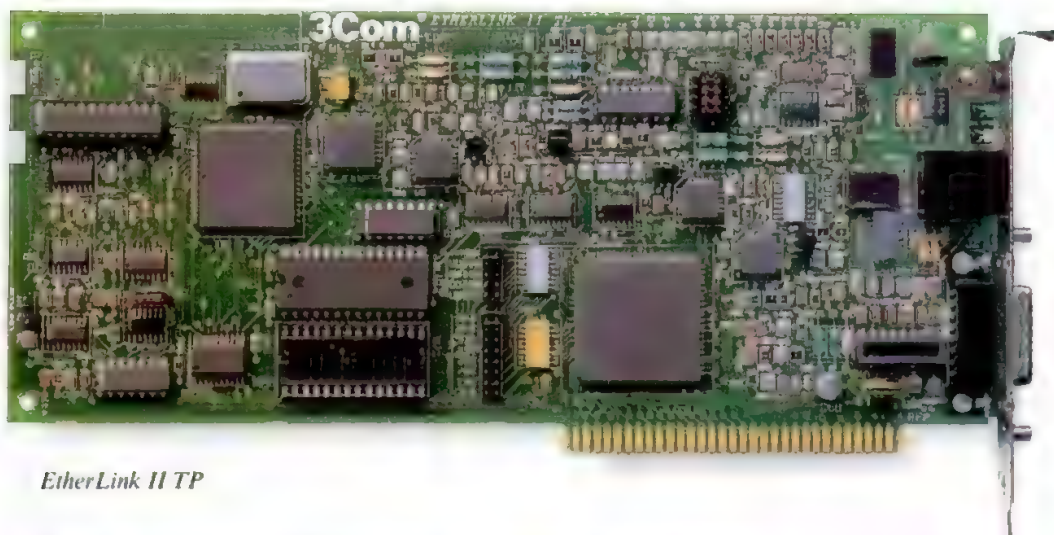
Every twisted question



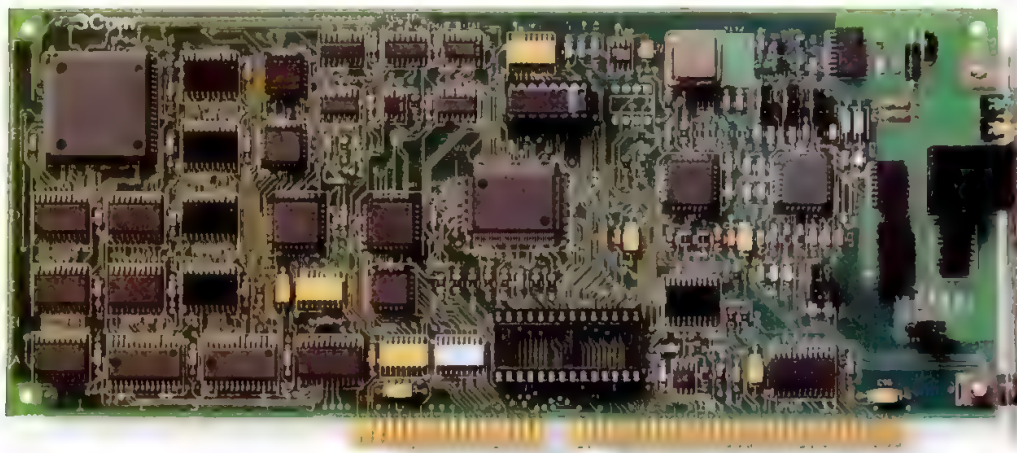
EtherLink/MC TP



MultiConnect



EtherLink II TP

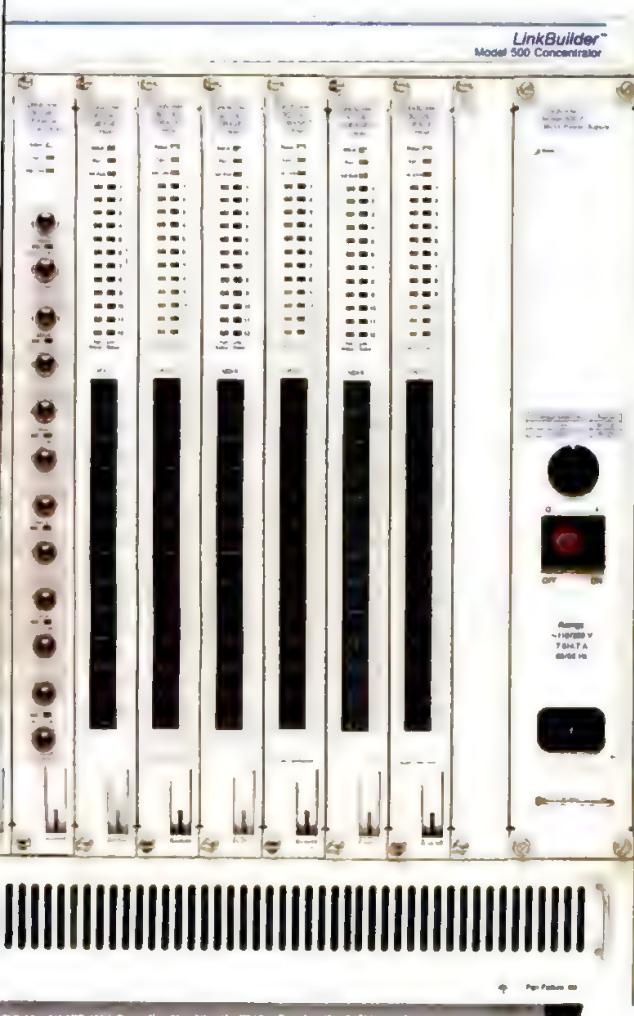


EtherLink 16 TP



Link Builder

deserves a simple answer.



Have you noticed that standards designed to simplify your life, often complicate it instead?

That's the way it is with twisted-pair wiring. In the long run, managing your network improves. But in the short run — implementation — that's where the worries come in.

Which is where 3Com comes in, too. 3Com® adapters and hubs let you adopt twisted-pair wiring without adopting worries about compatibility, flexibility and reliability.

3Com adapters are compatible with every major network operating system as well as all your PC platforms. And they are compatible with your pre-standard 10BASE-T hubs. So the investments you've made already are protected.

What's more, all 3Com adapters are network manageable. And you'll find installing them is simple. They come with a complete set of diagnostic tools to guide you every step of the way.

And once installed, they stay installed. All 3Com EtherLink® adapters come with a limited lifetime warranty. But with 2.5 million adapters shipped, and a mean time between failures of over 70 years, it's a safe bet you'll never have to call for help.

3Com hubs are equally worry-free. You never have to worry about accommodating different media on the same network. With 3Com hubs you can mix and match 10BASE-T with coax or fiber-optic modules. You can also choose 3Com hubs that are network manageable.

What's more, when you put 3Com hubs and adapters together, you gain even more peace of mind. They not only work together seamlessly, when you use the MultiConnect® model hub your data travels farther than with other 10BASE-T hubs.

So why worry? Just call 1-800-NET-3Com Dept. D3693 for your free brochure "Worry-Free 10BASE-T."

Even your most twisted questions have a simple answer.

3Com®

We network more types of systems
to more types of systems.™

CIRCLE 293 ON READER SERVICE CARD

DOS

stroke stroke stroke
stroke stroke stroke
stroke stroke stroke
stroke stroke stroke
stroke stroke stroke
stroke stroke stroke

Direct Access®

stroke

Here's a hardworking menu program that really lowers your handicap.

Getting into the programs on your hard disk with DOS commands can take longer than a foursome full of beginners. You should be using Direct Access.

All you do is load it and forget it. Direct Access lines up every program on a menu and lets you create custom sub-menus for related programs and other applications.

It's simple.

And it's complete. With features like user-defined screen blanking, password protection, three-level virus detection, mouse support and a unique feature that automatically tracks all time spent on your programs.

A network version is also available. You can

even customize the menu with your company logo.

The choice is easy. Keep stroking away with DOS commands. Or play through to your programs with Direct Access.

Call now for complete details, volume discounts and your nearest Direct Access dealer. For a limited time, get Pyro!™ The Entertaining Screen Saver for the PC, free! Just write "Pyro" on the Direct Access registration card before you return it.



PC Magazine Editor's Choice

CIRCLE 288 ON READER SERVICE CARD

Easy to stock and competitively priced, an upgradable PC may be your next purchase—even though you may never choose to upgrade that machine. PC Labs examines eight vendors who have devoted their efforts to this new design trend.



ILLUSTRATION: MIN JAE HONG

UPGRADABLE PCs

BETTING ON TOMORROW

by Winn L. Rosch

You've heard the hype: An upgradable PC will stave off obsolescence, save your company money, and boost your productivity over the years. Much of that is true. But upgradability by itself is not a reason to buy a particular PC. It's just another feature, like the size and layout of the case, the microprocessor locked inside, the disks or the ports that come as standard equipment.

Still, there are many reasons to consider this technology. Upgradables can save you a bit if you shop carefully. The basic systems are actually priced

IN THIS REVIEW

ALR BusinessVEISA
ALR Modular Processor System
ALR SX PowerFlex
Amkly 386/25e
AST Premium II
Copam B Series

Dell System 333P
Everex STEP 386 with
InSTEP 486
Reply Model 32
Tandon Option

about equal to or lower than many of their nonupgradable counterparts. Moreover, in most cases you won't give up substantial performance to gain upgradability. In PC Magazine Labs' tests, most upgrades fell near the average for the performance level of all machines using the same microprocessors and clock speeds.

Additionally, upgradable PCs can help a large organization keep inventories manageable. By tailoring the microprocessor inside to particular individuals, you can make one basic chassis design serve the needs of users with various skills.

But upgradables don't guarantee a win in the race against obsolescence. In many cases, you have no guarantee that your system will support the technology of the future. And sliding in a microprocessor module won't do anything to help break through the other performance bottlenecks in your computer: You'll still have the same old hard disk and video systems. Depending on your needs, you may be able to make a more worthwhile improvement in your PC than upgrading its microprocessor. For example, you'll probably get better *Windows* performance by adding an \$800 coprocessed graphics adapter than a CPU upgrade.

Moreover, a handful of upgrades deliver substantially lower performance than you'd get from a comparable nonupgradable PC—and they do so at a high price: Upgrade modules in the 486 class range from \$1,800 to more than \$2,500. Not only are these prices tantalizingly

close to the cost of a new system once you allow for a trade-in, they're also embarrassingly in excess of the cost of the 486 chip itself—\$445 as of this writing. Likewise, an upgrade from a 386SX to a 386, where the vendors offer it, will cost you somewhere between \$800 and \$1,500. (The 33-MHz 80386 chip costs \$202.)

Even if this balance of virtues and weaknesses cools your ardor toward upgradables, you can't ignore the technology. Most major computer manufacturers have made a commitment to upgradability; some have even taken nonupgradable systems off their production lines (or never offered them at all)—upstarts like Amkly Systems and well-established companies like Tandon, for instance.

UPGRADE TECHNOLOGIES

Nearly any PC is upgradable if you're willing to replace the motherboard or pry out the microprocessor and plug an upgrade board into its place (see the related story on AT-to-SX upgrades). The machines examined here—from ALR, Amkly, AST, Copam, Dell, Everex, Reply, and Tandon—are different in that they have been engineered to make the upgrade process easy. They differ in how much of the PC's circuitry is changed when you make an upgrade, as well as how you make the upgrade. As a minimum, you need to replace the system microprocessor—the approach Dell and

Everex take. At most, some upgrades come close to altering all the circuitry that would normally be installed on the system board—Copam, for instance.

The most venerable upgrade design, which none of these systems uses, is the backplane-oriented computer that puts the microprocessor, its associated circuitry, and the bus control logic on an ordinary expansion board that plugs into a passive bus. This design first showed promise in the CP/M-based computers that preceded and were eventually outmoded by the IBM PC in 1981. Occasionally the concept reappears—for example, in 1985 in the Wang Professional PC, and in 1987 in bus-oriented designs from Wyse and Zenith.

In general, however, the passive backplane is too limiting in a world where microprocessor technology has raced far ahead of today's bus standards. The need to transfer all data through the expansion bus results in an all-pervasive system bottleneck, bringing internal data-transfer speed down to the level set by the 8- to 12-MHz bus.

One alternative is to put the microprocessor and its high-speed memory on a special board that plugs into a proprietary expansion slot on the system board while keeping some circuitry (input/output, bus control, video) on the system board itself. The special slot need not be limited by the constraints of standard bus designs. Amkly and Copam take this type of approach.

The all-on-one processor board is of-

PRICE/PERFORMANCE INDEX

The Everex STEP wins for its combination of performance and features at a midrange price—in both its 386 and 486 incarnations.

Everex parlays the best performance numbers into the best bang for the buck. The STEP 386—with the InSTEP 486, which turns it into a 486—offers a moderately priced way of reaching that performance/features level. By contrast, the ALR SX PowerFlex falls behind the other 486s because of its poor performance. This ISA system suffers in part because of its 16-bit memory path.

The 486s generally appear farther to the right of the chart than the 386s, thanks to their superior processor scores. On the

other hand, their prices increase far more drastically than their performance/features scores would warrant. This occurs most likely because PC Labs tested these systems without optimizing them for each processor speed—and because disk and video scores remained unaffected by the upgrade. A nonupgradable 486 PC, for instance, might come with an ESDI or SCSI drive instead of the IDE drives we saw in this roundup.

Only Copam's 386SX/16-to-386/33 upgrade and Tandon's 386SX/20-to-486/33 switch gave performance boosts that came close to justifying their price increases.

THE DATA POINTS

The performance/features axis of the Bang for the Buck chart is based on ten data points: processor, memory, DOS file access, video speed, installed RAM, hard

disk capacity, VGA RAM, free slots, drive bays, and extras (miscellaneous items such as free bundled software, mouse, on-site service, FCC Class B certification, and more than a one-year standard warranty policy). These ten data points determine a system's position on the x-axis. A set of weighting factors has been applied to the raw numbers; you can find this data in the Software Library of PC MagNet's Editorial Forum, as 18BANG.WK1.

Location on the y-axis is based on each system's tested-configuration price (as listed in the fact file). We applied a 15 percent discount to the list prices of dealer-distributed systems to account for street prices.

Systems that appear closest to the upper-right-hand corner of the chart offer the best performance and features for the price.

UPGRADABLE PCs

ten costly and can be wasteful as well, if you are forced to toss out still-usable memory chips when you make the upgrade. Amkly allows you to move the old memory chips to the new microprocessor board, and Copam uses SIMMs, so you can transfer the memory in that company's system. Both vendors, however, charge \$2,300 or more for their 25-MHz upgrade modules—more than many comparable 33-MHz 486 modules.

In 1990, when IBM chose to design its PS/2 Models 90 and 95 as upgradable

machines, it put the microprocessor board into a special slot and separated it from memory. Instead of sharing the microprocessor board, memory was relegated to the system board (or to small memory boards attached to it), with the microprocessor board linked by a high-speed connection. Most upgradable manufacturers have followed this strategy, though with individual differences in the amount of circuitry on the processor board and in the

mechanics of its installation.

Everex Systems takes a minimalist approach: The InSTEP 486 upgrade board contains only the microprocessor and the few chips needed to match it to a 386 socket. The board itself plugs into the microprocessor slot. Dell allows the old processor to remain resident, just turning it off when the upgrade is made. Other makers (ALR, AST, Reply, Tandon) use proprietary boards for both the original and replacement microprocessors, requiring a board switch for the upgrade.





IBM believes these computers But only until

**Trade in your old Apple® and COMPAQ®
Trade up to PS/2.®**

Thanks to IBM, your old Apple and COMPAQ computers—even your IBM computers—can do more for you now than ever before.

Through December 31, you can redeem specific COMPAQ and Apple models, such as the DESKPRO® 286e and Macintosh® SE, for up to \$1,250 toward the purchase of the latest generation of IBM PS/2s, including i386™ SX and i486™ SX models. So PS/2 computers have never been more affordable.

For example, if you trade in your DESKPRO 286e with a color monitor, you can get up to \$850 toward the purchase of the world's best-selling 386 SX

personal computer, IBM's PS/2 Model 55 SX.

If you already own an IBM computer, there's never been a better time to upgrade. Because you can also trade in specific IBM PS/2 and PC models toward IBM's newest PS/2s. Then you'll know what people have known for years—an IBM computer retains its value exceptionally well.

And now more than ever, you'll realize the redeeming value of an Apple or COMPAQ computer: it can help you buy a PS/2. Contact your IBM Authorized Remarketer or call 1 800 272-3438, ext. 386 for the remarketer nearest you.

IBM and PS/2 are registered trademarks of International Business Machines Corporation. 386 and 486 are trademarks of Intel Corp. All other products are trademarks of their respective companies. ©1991 IBM Corp.



have some redeeming value.
January 1.



How're you
going to do it?
PS/2 it!





SYSTEM CONFIGURATION AND PERFORMANCE A GUIDE TO THE GRAPHICS

BENCHMARK TESTS

The Bars

These charts show each product's scores on four tests relative to the best, worst, and average scores of previously tested products in the same processor class. Each colored bar represents the **range** of test scores for nonupgradable systems in our database, from fastest to slowest. The longer the bar, the wider the range. If the best score is more than twice as fast as average, an upward-pointing arrow appears atop the colored bar.

A black arrow on each bar represents the given system's **position** relative to the historical range. The higher the arrow, the better the performance. If a system performs more than twice as fast as average, the black arrow appears at the top of the bar, pointing upwards.

The Boxes

A **normalized score** appears in the box below each colored bar. To derive this figure, we calculated the average score for all nonupgradable systems of the same processor type reviewed in *PC Magazine* over the past year. We then divided this average by the score of each machine in turn and multiplied by 100. In all cases, the normalized score is based on the average performance of systems running at the same processor level as the machine tested.

Thus the average score is 100; a number greater than 200 indicates that a system performed the test in less than half the average time; a number smaller than 50 indicates that the system took more than twice as long to complete the test.

A table of **actual scores** accompanies the three-dimensional bar charts.

Best score

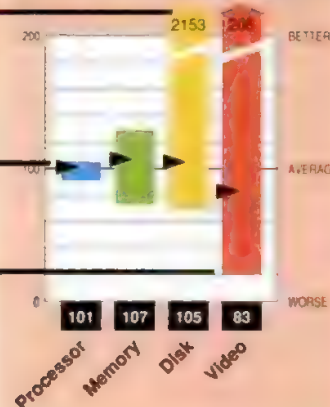
(previously reviewed products)

TEST RESULTS

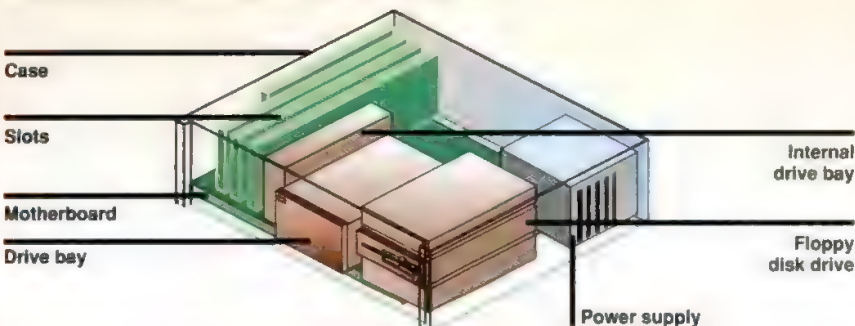
Product's score

Worst score

(previously reviewed products)



INTERIOR CONFIGURATION DIAGRAM



Case Options include desktop, tower, mini-tower, small-footprint, and slimline.

Slots The number and length of cards represent the number and length of slots on the motherboard.

Drive bay A hard disk face plate indicates external access to a bay. Options include full-height, half-height, third-height, and 3.5-inch.

Floppy disk drive A face plate indicates that either a 1.44MB or 1.2MB floppy disk drive was installed in our tested system.

EFFECTS ON PERFORMANCE

The division of labor between upgrade and motherboard can have dramatic repercussions in the performance of the upgrade. The primary concerns are memory and the system clock. If the system clock is maintained on the system board, switching upgrade modules won't alter the speed of the upgrade microprocessor. Dell and Everex take this approach and therefore limit your choices to 386s and 486s with the clock speed of the system you originally purchased.

Even when the upgrade board contains or controls the clock, memory bottlenecks can occur. For example, the ALR SX PowerFlex 486/25 upgrade and the Tandon Option use 16-bit memory connections. While this narrow bus is fine for 16-bit microprocessors such as the 286 and 386SX, it shortchanges 32-bit microprocessors (the 386DX and 486). The result, as PC Magazine Labs' benchmark tests

show, is slower 486 processor performance. Although memory caching on the microprocessor board can reduce the effect of the memory/microprocessor mismatch, you'll want to avoid these machines if you're seeking the utmost in performance.

Disk and video performance might also suffer. Sometimes the timing of the base microprocessor in a PC is a better match for the disk and video controllers on the system board than a faster upgrade is. As a result, accelerating the microprocessor may put the brakes on another part of system performance. Note that adding a 486 to the Everex STEP 386, the Amkly 386/25e, and the ALR SX PowerFlex results in a slight but discernible slowdown in the video speed of those systems, according to our benchmark tests.

Although some upgradable PCs suffer technological weaknesses, the larger flaw in the upgradable philosophy is economic.

Upgrading isn't always the most cost-effective way of keeping abreast of changing technology. Your other options are to trade in your computer when you buy a new one, or to hand down older PCs for less critical applications—the secretarial pool or a home office, for instance. In either case, you must factor in the value of the old PC when you compare it with the price of an upgradable.

THE TAXMAN COMETH

The growing perception among PC managers, however, is that upgrading makes good sense as a business decision. The deciding factor, according to industry consultant Cheryl Currid of Currid & Associates (Houston, Texas), is the five-year depreciation schedule for computer equipment propounded by the Internal Revenue Service.

PCs have to stay on corporate books and be depreciated over five years. In

some situations, the use of systems must be further prolonged; for example, some government contracts mandate tagging and tracking computer equipment for seven years, according to Edward Ying, product manager for system board maker Micronics Computers. Somehow the useful lives of PCs must be stretched to match. Upgradable systems offer such promise.

Unfortunately, this argument ignores an inevitable fact. The upgrades to those PCs end up on the company books, too, lodged there for another five-year period. After all, at more than \$2,000 for a 486 module, most upgrades are so expensive they must be capitalized. That means if you buy the upgrade two years after your initial purchase, for instance, the purchase stays on the books two years after you've written off the system itself.

Upgrading a PC better fits the definition of capital improvement than repair, and this pushes upgrades onto the depreciation schedule.

If your goal in upgrading is more to keep within budget constraints than to skate along the cutting edge of technology, the finances of upgrading require greater analysis.

The allure of the upgradable PC is that it can offer you a means to ease your way into an expensive system: Buy a low-line PC today and soup it up with a more powerful processor later. This philosophy can be flawed by a combination of mathematics and marketing. If you have to throw out the old microprocessor when upgrading, the upgrade path will inevitably be more expensive: You'll eventually pay

for a second microprocessor and whatever other circuitry constitutes the upgrade.

A manufacturer's trade-in policy can mitigate this damage, though the savings don't amount to much. For example, Amkly currently prices its 486 upgrade for its 386/25e system at \$2,300, with a trade-in of the old module. This price also represents the price differential between a new 386 system (\$5,595 in *PC Magazine's* standard configuration) and one factory-equipped with the 80486 processor (\$7,895). The Dell upgrade, which leaves your old 386 on the system board when you transform your computer to a 486, actually costs \$1,700—substantially less than the net price of the Amkly trade.

Actually, the odd economics of the trade-in can mean that the old-fashioned upgrade strategy of simply replacing your



EDITORS' CHOICE

■ Three A's: ALR BusinessVEISA, Amkly 386/25e, AST Premium II

In this review of upgradable-processor PCs, we chose to focus on the technologies that companies have implemented. The ten machines we tested are representative of a larger field. Our Editors' Choices reflect our conclusions: Properly implemented, upgradable-processor technology performs indistinguishably from fixed-CPU designs.

A business that standardizes its PC purchases on one upgradable design will find it easier to service and support the machines because they contain common parts. But we question the wisdom of buying an upgradable PC today so that you can plug in a faster CPU, say, three years down the road: You'll have to live with three-year-old disk and video technology. It's better to buy a new machine and pass the aging PC down to someone else.

Among these systems, ALR's BusinessVEISA is an excellent choice. You get a well-engineered box in a small footprint with plenty of room for memory expansion and an adequate number of drive bays. ALR's upgradable technology extracts no performance penalties. Upgrading is simple: You just pop

out the old board and pop in a new one that holds both the CPU and a math coprocessor slot. ALR softens the financial cost of upgrading with a rebate for the old microprocessor.

Another standout: Amkly Systems, a newcomer, made its debut with a fresh design for its 386/25e, upgradable to a 486/25. This EISA system uses a solidly constructed lift-out chassis for the power supply and hard disks. Flash EEPROM for the BIOS further distinguishes it from the crowd. The system's shortcomings: lack of a 33-MHz offering and an expensive processor upgrade.

AST Research makes choosing among its machines simple: Except for the Bravo line, all its desktop PCs are upgradable. The company's proprietary FASTboard upgrades easily. When you insert the new board, the AST senses the change and adjusts automatically to the new chip. These machines aren't top performers, but processing speed differences are slight enough that most users wouldn't care. If you do a lot of graphics work, though, the slow motherboard-based video may give you second (and third) thoughts.

AVOID 16-BIT DESIGNS

There's only one design we have difficulty recommending, particularly for an upgrade to a 486: Any system based on the 80286 chip's 16-bit data path is bound to suffer in a 32-bit environment. In this review, ALR's ISA offering, the SX PowerFlex, upgradable from a 286 through a 486/25, had clearly below-average performance as a 486. Even the Tandon Option, which otherwise showed signs of superb design at a very reasonable price (\$4,653 for a 486/33), lagged when we installed its Nintendo-style 486 processor cartridge. Should this computer become available as a true 32-bit system, it's likely to be a winner.

The Everex STEP machines topped our performance tests and had fine features, but we can't recommend them: It's just too easy to stick the pins of the upgrade card into the wrong holes.

No matter what your choice, remember to investigate any of the 21 other vendors that now offer upgradable PC designs. They are listed in the accompanying table "Upgradable PCs: Additional Sources."

Quality Repeats Itself...

... look no further than the EPS SX/20 MHz ... The EPS SX/20 MHz is the 286 buster you've been looking for.

PC Sources 4/91

End users voted EPS SX system "Reader's Choice Award" for all of 1990.

Computer Monthly 2/91

If you guarantee quality as well as price and service, you've got the perfect purchase triangle ... EPS is an excellent example of this three cornered philosophy.

Computer Shopper 2/91



The EPS 386 is a machine bursting with promise. On paper and in our test the machine gives up nothing to it's competitors ... EPS is committed to the long haul.

PC Magazine 12/90

... with all these advantages, it's hard to find a 33 MHz 486 based computer that will give you a better value.

PC Sources 5/91

End users voted 486-33 system "Reader's Choice Award" for all of 1990.

Computer Monthly 2/91

Call Today...

and purchase your EPS system in one of the following ways:

- MasterCard or Visa (no surcharge)
 - C.O.D. Plan
 - Leasing Options
 - GSA Contract
 - Purchase Orders (upon approval)
 - Cashiers' Check, Money Order
- (Allow 2 weeks for company checks to clear)

**GSA
Contract
Approved**

Order Toll-Free

1-800-447-0921

Also Available in Canada

Tech Hot Line 1-800-526-4258

Sales Hours: Mon.-Fri. 8:00 AM to 7:00 PM (CST)
Saturday 9:00 AM to 3:00 PM (CST)

The brands and product names mentioned are trademarks or registered trademarks of their respective holders.

* Picture Shown with optional 1.44 MB 3 1/2" Drive.

Month after Month Over 45% of Our Shipments Go To Repeat Buyers.

EPS 386-SX 20MHz

- INTEL 80386/SX 20 MHz Microprocessor
- 4 Meg O Wait State RAM
- Desktop Case/220 Watt Power Supply
- Socketed for 80387/SX Co Processor
- AMI BIOS/Clock Calendar
- 1 Parallel/2 Serial/1 Game Port
- Slots 2-8, 6-16 Bit
- TEAC 1.2 MB 5 1/4" Floppy Drive
- MAXTOR 60 Meg IDE HD (15MS) (150,000 hr. MTBF) 32k Cache
- MAXTOR 16 Bit IDE Controller
- EPS 14" Color Monitor 1024 x 768 .28 Dot Pitch
- w/ 1024 x 768 1 Meg SVGA card (1 Meg for 256 colors at 1024 x 768) (1 Meg for 32,768 colors at 800 x 600)
- 101 Enhanced Keyboard
- MS Windows 3.0 w/ Logitech Mouse
- MS DOS 5.0 w/ Q Basic
- 1 Year Warranty/On Site Service
- 60 Day Money Back Guarantee
- System User Manuals



\$1,595.00

EPS 386-25 MHz

- INTEL 80386/25 MHz Microprocessor
- 4 Meg O Wait State RAM
- Desktop Case/220 Watt Power Supply
- Socketed for 80387 or Weitek Co Processor
- AMI BIOS/Clock Calendar
- 1 Parallel/2 Serial/1 Game Port
- Slots 2-8, 5-16 and 1-32 Bit
- TEAC 1.2 MB 5 1/4" Floppy Drive
- MAXTOR 60 Meg IDE HD (15MS) (150,000 hr. MTBF) 32k Cache
- MAXTOR 16 Bit IDE Controller
- EPS 14" Color Monitor 1024 x 768 .28 Dot Pitch
- w/ 1024 x 768 1 Meg SVGA card (1 Meg for 256 colors at 1024 x 768) (1 Meg for 32,768 colors at 800 x 600)
- 101 Enhanced Keyboard
- MS Windows 3.0 w/ Logitech Mouse
- MS DOS 5.0 w/ Q Basic
- 1 Year Warranty/On Site Service
- 60 Day Money Back Guarantee
- System User Manuals

\$1,795.00

EPS 386-33 MHz

- INTEL 80386/33 MHz Microprocessor
- 4 Meg O Wait State RAM
- 128K (25 NS) Static RAM Cache Expandable to 256K
- Desktop Case/220 Watt Power Supply
- Socketed for 80387 or Weitek Co Processor
- AMI BIOS/Clock Calendar
- 1 Parallel/2 Serial/1 Game Port
- Slots 2-8, 5-16, 1-32 Bit
- TEAC 1.2 and 1.44 MB Floppy Drives
- MAXTOR 80 Meg IDE HD (17MS) (150,000 hr. MTBF) 32k Cache
- MAXTOR 16 Bit IDE Controller
- EPS 14" Color Monitor 1024 x 768 .28 Dot Pitch
- w/ 1024 x 768 1 Meg SVGA card (1 Meg for 256 colors at 1024 x 768) (1 Meg for 32,768 colors at 800 x 600)
- 101 Enhanced Keyboard
- MS Windows 3.0 w/ Logitech Mouse
- MS DOS 5.0 w/ Q Basic
- 1 Year Warranty/On Site Service
- 60 Day Money back Guarantee
- System User Manuals

\$1,995.00

EPS 486-33 MHz

- INTEL 80486/33 MHz Microprocessor
- 4 Meg O Wait State RAM
- 128K (25 NS) Static RAM Cache Expandable to 256K
- Desktop Case/220 Watt Power Supply
- Socketed for Weitek 4167 Co Processor
- AMI BIOS/Clock Calendar
- 1 Parallel/2 Serial/1 Game Port
- Slots 1-8, 6-16, 1-32 Bit
- TEAC 1.2 and 1.44 MB Floppy Drives
- MAXTOR 213 Meg IDE HD (15MS) (150,000 hr. MTBF) 32k Cache
- MAXTOR 16 Bit IDE Controller
- EPS 14" Color Monitor 1024 x 768 .28 Dot Pitch
- w/ 1024 x 768 1 Meg SVGA card (1 Meg for 256 colors at 1024 x 768) (1 Meg for 32,768 colors at 800 x 600)
- 101 Enhanced Keyboard
- MS Windows 3.0 w/ Logitech Mouse
- MS DOS 5.0 w/ Q Basic
- 1 Year Warranty/On Site Service
- 60 Day Money Back Guarantee
- System User Manuals



\$2,895.00

EPS SX/20 MHz NOTEBOOK

- Intel 80386-SX 20 MHz Processor
- 2 Megs of memory (Expandable to 4 Meg)
- Socket for the 80387-SX 20 Co-Processor
- AMI BIOS/Clock Calendar
- Parallel and serial ports
- Built in 3.5" 1.44 Floppy Disk Drive
- Conner 60 meg IDE Hard Drive (17ns)
- Backlit LCD High Resolution VGA Display (640x480)
- 16 Gray Scales
- External Monitor Interface
- External 101/102 Keyboard, Adaptor for mouse port
- 80/81 key Keyboard with 12 function keys (101 or 102 key compatible)
- Quick Charge or Trickle Charge using 100v-200v AC/DC Converter
- Removable Nicad battery pack
- System Wt. 6.3 Lbs/System Dimensions W 11.0/ D 8.5/ H 1.98 inches
- 60 Day Money Back Guarantee
- 1 Year Warrantee
- System user manual
- Call for customizing options

\$2,295.00

NEW

EPS 386-40 MHz

- Same features as the above 386-33 MHz system except with genuine AMD 40 MHz CPU

\$2,095.00

**14" Non Interlaced Color Monitor 1024 x 768 .28 Dot Pitch.
Add to any system\$65.00**



"a tradition of value and performance"

**60-Day
Money Back
Guarantee!**

**EPS
Technologies, Inc.**

**10069 Dakota Ave.
P.O.Box 278 Jefferson, SD 57038
605-966-5586 FAX Orders: 605-966-5482**

old system makes good sense, from both the accountant's and engineer's viewpoints. Your old PC is likely to bring in some money; moreover, when you replace your entire PC, you get the benefit of all the new technologies—the quickest disks, better video—along with a new microprocessor.

All used PCs have some value, just as used automobiles do. Some dealers allow you to trade in your old PC when moving to a new one. Alternatively, you can sell your old machine on the open market or with the aid of one of about 125 computer exchanges worldwide. Even when you factor in the near-standard 15 percent charged by computer exchanges for arranging transactions, the cost of trading in a complete PC is quite competitive with making an upgrade.

The value of used PCs closely follows the cost of new machines, according to Alex Randall, president of the Massachusetts-based Boston Computer Exchange (617-542-4414), one of the oldest such organizations. When major manufacturers like IBM and Compaq reduced their list prices by 30 percent, used-system prices fell equivalently. One rule holds fast, however: PCs from first-tier manufacturers Apple, Compaq, and IBM hold their value best. For example, in early July an original IBM PC AT was valued at \$750 and a Compaq Deskpro 386 at \$3,000 by the Boston Computer Exchange. Second-tier machines (ALR, AST, Dell, Zenith, and other familiar brands) are valued about 15 to 20 percent lower for equipment of similar vintage and performance. Third-tier computers—no-name machines from the Pacific Basin and garage workshops—have little value.

In the same price range as these 486 upgrades, you'll also find new 486-based system boards from name-brand manufacturers that can be used to upgrade almost any PC. For example, Micronics Computer estimates the street price of its 33-MHz 486 system board at \$1,550. Mylex offers its MAE486, a 33-MHz 486 system

board with an EISA expansion bus, for \$3,480 retail—a price that converts to about \$2,600 on the street, according to Mylex.

Obviously, money is not the primary reason to choose an upgradable PC over a conventional PC that can be upgraded by exchanging the system board. Rather, the issue is convenience. Upgradables make the change easier. System boards take somewhat longer to install (about half an hour to an hour, compared with 10 minutes for most proprietary upgrades). Moreover, a new system board will give your PC a new BIOS and a new personality; a proprietary upgrade will keep both its personality and warranty intact.

WHAT TO DO

If you want to stave off obsolescence, determine whether you want to pin your hopes on the promise that a company will introduce upgrades to match each advance in microprocessor technology. Having an

upgradable PC won't mean anything to you if, when the 100-MHz 586 or 250-MHz 686 of your dreams comes out, no one makes an upgrade board for your system.

This is a real possibility, as history has shown. Lanier Business Systems offered an upgradable system in 1989, for instance, but the company was bought out by Syntrex in 1990. While Syntrex has vowed to support the Lanier customers and hardware, the company no longer manufactures upgrades. In another scenario, Zenith Data Systems introduced a system upgradable from a 286 to a 386 microprocessor in 1987, but never adapted it to the 486 when that chip became available. (Zenith reports that the 386 upgrade is still available, however.)

If you're still convinced that this feature is right for you, make sure that upgrading an old system will be the most cost-effective strategy. If you have no upgrade plans, then ignore upgradability



UPGRADABLE PCs: ADDITIONAL SOURCES

Besides the ten systems we examined, 21 vendors have announced upgradable-processor systems. They are listed here, along with the upgrade levels they offer.

	386SX/16	386SX/20	386/25	386/33	386/40	486SX/20	486/25	486/33
1 Arche Technologies Inc.			✓	✓				✓
2 Arel Design Inc. *			✓	✓			✓	✓
3 Blackship Computer Systems Inc.				✓				✓
4 Boss Technology Corp. *			✓	✓			✓	✓
5 Compaq Computer Corp.				✓				✓
6 Computer Market Place Inc.				✓				✓
7 Digital Scientific Research Corp.	✓		✓					
8 IBM Corp.						✓	✓	✓
9 International Instrumentation Inc. *			✓	✓			✓	✓
10 Master Computer Inc.			✓	✓			✓	✓
11 Micro Express				✓				✓
12 National Micro Systems Inc. *			✓	✓			✓	✓
13 Northgate Computer Systems Inc.			✓	✓	✓	✓		✓
14 PC Pros/Touche Micro Technologies			✓	✓			✓	✓
15 Polywell Computers Inc.	✓		✓					✓
16 Proteus Technology Corp. *			✓	✓			✓	✓
17 Sirius Systems Technology Inc.	✓	✓	✓					
18 Systems Integration Associates *			✓	✓			✓	✓
19 Texas Instruments Inc.								
20 Twinhead Corp.			✓			✓	✓	
21 Zeos International Ltd.			✓	✓		✓	✓	✓

* Systems can be upgraded only from 386/25 to 486/25 or from 386/33 to 486/33.

OUR CONTRIBUTORS

Bruce Brown, and **Winn L. Rosch** are contributing editors of *PC Magazine*.

Mario Baldasserini is a Junior Technical Analyst at PC Magazine Labs. **Gary Berline**, **Patrick Honan**, **Wendy Dugas Pérez**, and **John R. Quain** are New York-based free-lance writers and are frequent contributors to *PC Magazine*.

Greg Pastrick is a free-lance writer and reviewer for *PC Magazine*.

and instead examine the tried-and-true purchase considerations: price, features, and performance. If the price of an upgradable system is substantially more than a similar product that cannot be upgraded, you'd be foolish to buy it if you have no upgrade plans. If the upgradable system costs the same as or less than a nonupgradable equivalent (one that delivers exactly the same performance and features), then you have no reason to shy away from the upgradable.

REVIEW CRITERIA

The ten machines reviewed here are only a representative sample of the many upgradables already on the market and a hint of what is to come. All offer at least two different processor levels: a 386 (SX or DX) and a 486. We passed up systems that upgraded to higher speed ratings within one processor class, such as IBM's PS/2 Models 90 and 95, which at the time this story was written were upgradable from 25-MHz 486 to 33-MHz 486 only. (A 486SX module has since become available.)

We also chose systems whose upgrades were shipping. This criterion eliminated Northgate from the running, since the 486/33 and 486SX/20 upgrades to its Scalable Processor Array system were not yet available to the public. In addition to the 8 manufacturers that are discussed here, at least 22 other companies currently offer upgradable systems. (For more products and processor upgrades, see the table "Upgradable PCs: Additional Sources.")

We chose these systems to illustrate the diversity of upgradable technology and the different upgrade paths used by different manufacturers. ALR and Tandon, for instance, are shipping systems

UPGRADABLE PCs

that upgrade from 286s through 486s. Amkly, AST, Copam, and Reply give potential customers a wide range of choices within the 386SX, 386DX, and 486 ranges. And Dell and Everex offer buyers just two choices: 386DXs and 486s running at the same clock speed.

Advanced Logic Research shows how upgradability can be adapted to all three major expansion bus alternatives (ISA, EISA, and Micro Channel). Amkly Systems adds modular hardware and easy-to-modify Flash ROM to store its BIOS so that firmware can be modified when upgrading without the need to exchange ROM chips. AST Research relies on its own CUPID-32 (Completely Universal Processor Input/Output Design) architecture to separate the microprocessor and other high-speed circuitry from the slower expansion bus and I/O devices so as to remove potential speed limits from upgrades. Copam brings a wide range of upgrades to its systems, all the way up to a 40-MHz 386 (from Advanced Micro Devices).

Dell takes an unusual approach to upgradability: You add a new microprocessor without removing the old. Everex takes a seemingly nonupgradable system and notches up its microprocessor—from 286 to 386 or from 386 to 486—with a single upgrade board, sufficing for any clock speed in the upgrade range. Reply focuses on Micro Channel and delivers a powerful jump, from 386SX to 486, more than any other MCA system maker—something neither IBM nor ALR does today. And Tandon turns the upgrade to a simple plug-in module that can be easily installed without tools in less than a minute.

This rush to market of upgradable makers is motivated by more than an altruistic gift to you for avoiding obsolescence. Manufacturers and dealers benefit from upgradability, too, perhaps even more than you will. The vendors can trim the number of different computers gathering dust on their shelves and still cover the needs and demands of everyone from neophytes to power users. Reducing in-

ventories means cutting costs, an important consideration in today's price-competitive market. More than just lower prices for you, however, keeping costs down means survival for many companies. And that's vital to you if you hope to buy an upgrade for your PC in the coming years.

ADVANCED LOGIC RESEARCH INC. ALR BusinessVEISA

by Bruce Brown

The ALR BusinessVEISA's 386 and 486 processors perform better than many nonupgradables in their class.



Advanced Logic Research's upgradable VEISA systems are a solid value, giving you better-than-average performance on all processor platforms when compared with other vendors' upgradable systems. ALR's meticulous design engineering is also evident in the company's simple processor-board upgrade system, which requires that you switch only a single card. No other configuration steps are necessary. Although the ALR VEISA list and discounted prices for upgradable machines are higher than those of many vendors for standard systems, ALR holds its own when its prices are compared with those of other upgradables.

SMALL-FOOTPRINT ONLY

ALR doesn't sell large cases for its upgradable EISA systems. The only configuration available is the 6.5-by-14.5-by-17.5-inch box. For most users the case's four drive bays (two accessible 5.25-inch half-height bays and two 3.5-inch bays, one accessible and one internal) will be enough. ALR includes a 145-watt power supply with four power leads and a com-

SPUR YOUR PRODUCTIVITY!

ANNOUNCING

COMPUTER SELECT™

The Most Complete Database of Computer Product Information Available

Get instant access to more than...

- ✓ 70,000 articles and abstracts from over 140 leading publications
- ✓ 70,000 hardware, software and communications product specs
- ✓ 12,000 company profiles, including addresses and phone numbers
- ✓ 9,000 definitions of computer and telecommunications terms.

With COMPUTER SELECT, you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyers guides.

And now COMPUTER SELECT incorporates all the reference information from Data Sources®, the leading computer industry directory. You'll find specs for over 70,000 hardware, software and data communications products — plus profiles of the 12,000 companies that make the products you want.

See results in less than one hour

New users are doing productive work in less than one hour. No installation is needed. Just pop in the CD-ROM disc and a few simple steps locate, retrieve and print the information you want. And a new, updated disc is sent to you each month so you'll always have current product information.



CALL NOW FOR A FREE DEMONSTRATION DISK

212-503-4400

COMPUTER

LIBRARY

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. © 1991 Ziff Communications Company

CIRCLE 158 ON READER SERVICE CARD

COMPUTERS UPGRADABLE PCs



UPGRADABLE PCs SUMMARY OF FEATURES

Products listed in alphabetical order

Reference system processor indicates the processor level of the computer described in this table. (Where a range of options is given—as in the case of installable RAM or hard disk options—table entries indicate those available for the system reviewed.)

List prices For this review of upgradable computers, we list the price of selected systems in a standard configuration that consists of a 386SX, 386, or 486 processor, 4MB RAM, an optional processor RAM cache, a 100MB hard disk, at least one high-density floppy disk drive, a VGA color video display subsystem, at least one parallel and two serial ports, a keyboard, and DOS 4.01. All ten PCs reviewed here offer a reasonably close match to this list of requirements.

Distribution channel Some machines are sold directly through mail order, others through dealers. Dealers have previously offered discounts of 25 percent or more off the list price, however, an industry-wide price restructuring has cut these discounts in many cases. PC Magazine views a 15 percent discount as typical.

Chip set manufacturer indicates which company makes the support logic that connects the CPU with the other functions managed by the system board.

We list the BIOS version of our reference system only; in some instances, this BIOS must be changed when upgrading to a new processor. Refer to the reviews for discussion of BIOS upgrades.

Setup can reside either on a floppy disk or in ROM.

	ALR BusinessVEISA	ALR Modular Processor System	ALR SX PowerFlex
Reference system processor	386/33	386/33	386SX/20
Other processor options	486/25, 486/33	486SX/20, 486/25, 486/33	386SX/16, 486/25
List prices	386/33, \$3,795; 486/25, \$5,095; 486/33, \$5,495	386/33, \$5,093 (with cache, \$5,892); 486/33, \$7,593	386SX/20, \$3,243; 486/25, \$5,038
Distribution channel	Dealers	Dealers	Dealers
Bus architecture	EISA	MCA	ISA
Standard case type	Small-footprint	Small-footprint	Small-footprint
Motherboard manufacturer	ALR	ALR	ALR
Chip set manufacturer	Intel	Intel	C&T, Micro Technology
BIOS version	Phoenix 1.00.09A	Phoenix 1.02.03H	Phoenix 3.10.11
Setup/password in ROM	■ / ■	■ / ■	■ / ■
System shadowing/Video shadowing	■ / ■	■ / ■	■ / ■
MEMORY AND PROCESSOR RAM CACHE			
System RAM arrangement	Interleaved page	Page mode	Interleaved page
Installable RAM	1MB–49MB	1MB–49MB	1MB–5MB
Location	Motherboard	Motherboard, card	Motherboard
Installable cache options	64K	16K	32K
Cache controller	Discrete logic	Intel	Austek
Controller location	Add-in board	Motherboard	Processor card
DISK DRIVES			
Drive bays	4 half-height	5 half-height	2 half height, 2 3.5-inch
Hard disk controller location	Card	Integrated	Integrated
Hard disk options	120MB–1.2GB	80MB–340MB	40MB–200MB
EXPANSION BUS			
Expansion slots:			
8-bit	None	None	1 (open)
16-bit	2 (2 open)	4 (4 open)	5 (4 open)
32-bit EISA/MCA	4 (2 open)	2 (2 open)	None
32-bit proprietary	3 (1 open)	2 (2 open)	1 (open)
Ports originate on motherboard	■	■	□
VIDEO			
Standard display mode	SVGA	VGA	VGA
Display circuitry location	Card	Card	Card
Interface	16-bit	16-bit	16-bit
Adapter manufacturer	Western Digital	ALR	Western Digital
Chip set manufacturer	Western Digital	C&T	Western Digital
MISCELLANEOUS			
Supports Weitek coprocessor	■	■	□
Power supply (watts)	145	145	230
Number of device connectors	4	4	4
Warranty	1 year	1 year	1 year
Service	Dealer, vendor	Dealer, vendor	Dealer
FCC Class B identification number	E7YBU38633DT	E7YMP52386DX33	E7Y-PWRFLEX286

■—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

COMPUTER UPGRADABLE PCs

Shadowing Shadow RAM is a technology that loads video BIOS or system BIOS directly into fast RAM on boot up of the computer, offering enhanced performance speed. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM.

System RAM arrangement refers to the method in which memory is addressed. Different arrangements aim at avoiding the wait states imposed when CPU speed outpaces conventional memory speed.

Page-mode architecture allows back-to-back memory accesses within banks of RAM defined as pages.

Interleaved RAM arrangement divides memory into two or four portions that process information alternately. The CPU sends information to one section for processing while another section undergoes a refresh cycle. Systems may also use interleaving in conjunction with page-mode architecture.

We refer to this arrangement as **interleaved page**. Row/column, the original method of accessing data, is a subset of the page-mode memory architecture.

Installable RAM indicates the minimum and maximum amounts of memory that can be installed. **Installable cache options** refers to RAM cache. Both RAM and RAM cache can be located on the motherboard or on a separate card.

Expansion slots For each type of expansion slot—8-bit, 16-bit, 32-bit EISA/MCA, and 32-bit proprietary—we report the number of slots on the motherboard. The number in parentheses is the number of slots left open when the PC is equipped in our standard configuration.

Standard display mode refers to the resolution of the video card that came in the model we received for review. For this review, we requested a Super VGA display (800- by 600-

pixel resolution), though we accepted 1,024-by-768 resolution as well.

The **display circuitry** can reside on an expansion card or on the motherboard. Motherboard circuitry is often faster, but if it cannot be disabled there is no way to upgrade it.

Number of device connectors indicates how many internal storage devices the power supply can support without requiring Y cables (power splitters).

FCC Class B identification number Systems with a Class B rating from the Federal Communications Commission can be purchased for home use. Public Access Link, the FCC's bulletin board service (301-725-1072), lists every Class B system by its FCC identification number.

Amkly 386/25e	AST Premium II	Copam B Series	Dell System 333P	Everex STEP 386 with InSTEP 486	Reply Model 32	Tandon Option
386 25	386SX 20	386SX 16	386 33	386 33	386 33	386SX 20 (cached)
386 33, 486/25	386 33, 486 33	386 25, 386 33, 486/25	486 33	486 33	386 25, 386 33, 486SX/20, 486/25, 486/33	286 16, 386SX/20 (no cache), 486 33
386/25, \$5,595; 486/25, \$7,895	386SX/20, \$3,395; 386/33, \$4,115; 486/33, \$5,815	386SXB/16, \$2,338; 386B/33, \$3,055; 486B/25, \$4,492	386/33, \$3,917; 486/33, \$5,616	386/33, \$4,011; 486/33, \$7,010	386/33C, \$5,739; 486/33, \$7,739	386SX/20 with cache, \$2,998; 486/33, \$4,198
Dealers EISA Small-footprint Amkly Intel Phoenix 1.00	Dealers ISA Small-footprint AST AST AST Premium II 2.0	Dealers ISA Small-footprint Copam C&T, OPTi Phoenix 1.01	Direct ISA Slimline Dell VLSI Tech Phoenix 1.10 A11	Dealers ISA Desktop Everex Intel AMI Rev. G3-03C	Direct MCA Small-footprint Reply C&T C&T/Reply 1.01	Dealers, direct ISA Small-footprint Tandon Western Digital Tandon 217-3.74 002-16
■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ / ■ ■ ■	■ / ■ ■ ■
Interleaved page 2MB-112MB Processor card None N/A N/A	Interleaved 1MB-80MB Processor card None N/A N/A	Interleaved page 1MB-16MB Processor card 64K OPTi Processor card	Interleaved page 1MB-16MB Motherboard 32K Austek Add-in board	Row-column 4MB-64MB Motherboard 128K, 256K Proprietary Motherboard	Interleaved 2MB-128MB Motherboard 128K Austek Processor card	Interleaved page 2MB-32MB Motherboard 32K, 64K Austek Processor card
2 half-height, 2 3.5-inch	2 half-height, 1 third-height, 2 3.5-inch	4 half-height	2 half-height, 1 3.5-inch	1 full-height, 3 half-height	2 full-height, 3 half-height, 2 3.5-inch	1 full-height, 2 half-height, 1 3.5-inch
Integrated 114MB-310MB	Integrated 40MB-210MB	Integrated 44MB-211MB	Integrated 40MB-320MB	Integrated 20MB-1GB	Integrated 40MB-1.2GB	Integrated 40MB-400MB
None None 6 (6 open) 1 (open)	1 (open) 5 (4 open) None 3 (2 open)	None 4 (4 open) None None	None 3 (3 open) None None	1 (open) 6 (5 open) None 1 (none open)	None None 5 (5 open) None	1 (open) 6 (6 open) None None
■	■	■	■	■	■	■
1,024 x 768 Motherboard 16-bit Western Digital Trident	SVGA Motherboard 16-bit Western Digital Western Digital	1,024 x 768 Motherboard 16-bit Trident Trident	VGA Motherboard 16-bit Western Digital Western Digital	SVGA Card 16-bit Everex Tseng	1,024 x 768 Motherboard 16-bit C&T C&T	SVGA Motherboard 16-bit Tandon Western Digital
■	□	■	□	■	■	□
200 5 1 year Dealer, vendor IFWAKREN38625E	145 4 1 year Dealer DKASTMS386SX-20	160 4 1 year On-site, dealer 386SXB 16 DXO386SXB	85 4 1 year On-site E2K333P	200 4 1 year On-site E3EEX 2800D-L	200 4 1 year Vendor IA3BR-06-27-55	150 4 1 year On-site DFK7C8T30000

AMI—Advanced Megatrends Inc., C&T—Chips and Technologies Inc.

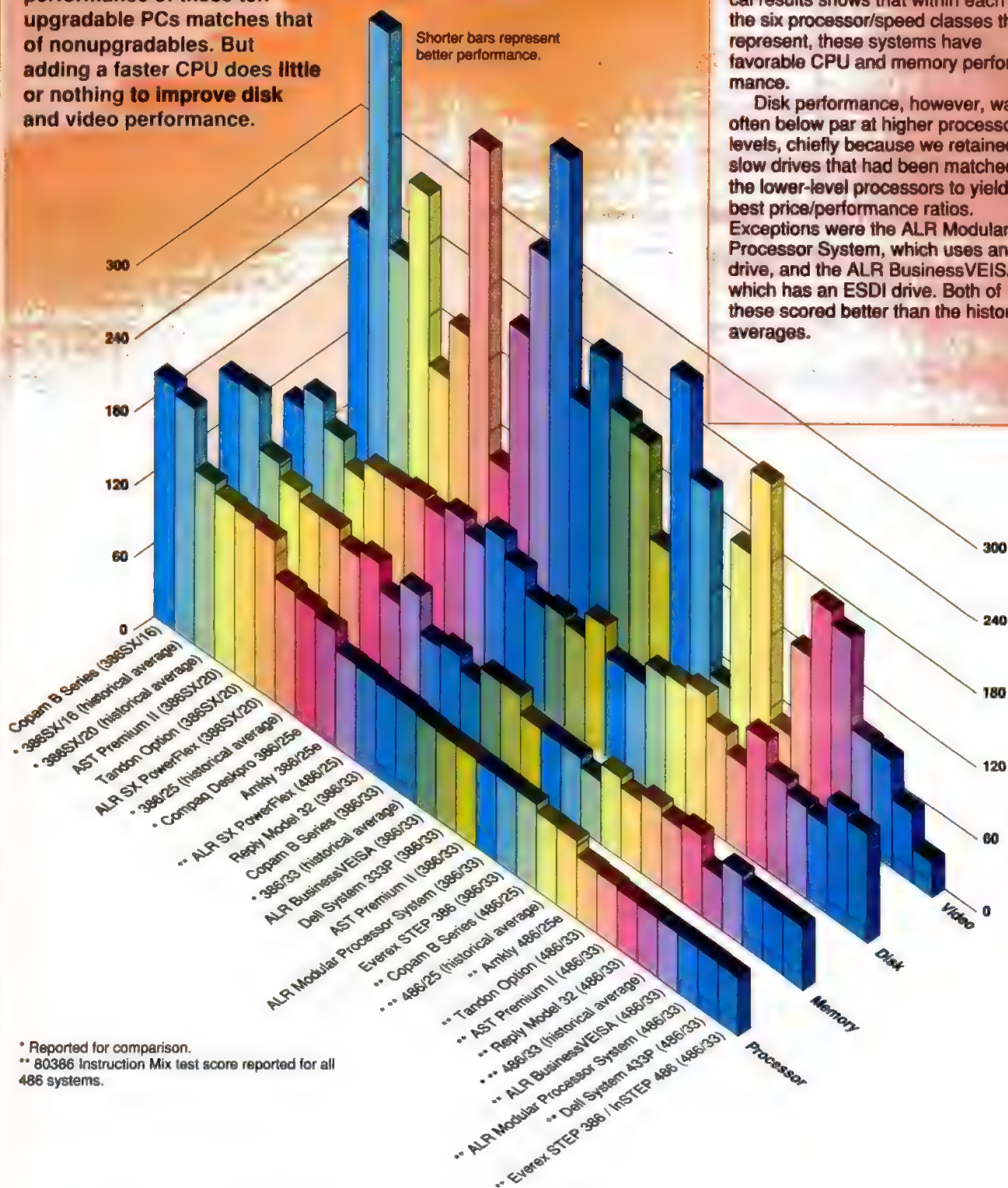


BENCHMARK TEST(1) UPGRADABLE PCs

The processor and memory performance of these ten upgradable PCs matches that of nonupgradables. But adding a faster CPU does little or nothing to improve disk and video performance.

Relative Times
Compaq Deskpro 386/25e = 100

Shorter bars represent better performance.



WHAT THE NUMBERS MEAN

Comparing these 23 PC configurations with PC Magazine Labs' historical results shows that within each of the six processor/speed classes they represent, these systems have favorable CPU and memory performance.

Disk performance, however, was often below par at higher processor levels, chiefly because we retained the slow drives that had been matched to the lower-level processors to yield the best price/performance ratios. Exceptions were the ALR Modular Processor System, which uses an IDE drive, and the ALR BusinessVEISA, which has an ESDI drive. Both of these scored better than the historical averages.

* Reported for comparison.

** 80386 Instruction Mix test score reported for all 486 systems.

Our tests also showed that changing the processor type or speed has little effect, if any, on disk performance.

In each processor group, most systems performed as well as their non-upgradable counterparts. There were two apparent exceptions, the ALR SX PowerFlex 486/25 and Dell System 333P. Initially the latter turned in slow processor and memory times, but when we added a \$299 32K cache module, that configuration logged in among the leaders in its class. All 80486 configurations executed the 80386 and 80486 Instruction Mix tests with negligible differences between the two scores.

The impact of memory cache was also evident. When we removed external cache while upgrading the units with 486 processors, memory times

suffered in every machine. Except for the ALR and Reply machines, memory performance fell somewhat below our historical average for 486s. The 80486 chip's built-in 8K cache did not make up for the loss of the larger external cache used with an 80386.

Most of the systems showed little if any difference in video efficiency as the processors were upgraded. The Dell, Tandon, and Copam units logged quicker video times with their 486 processors; the Amkly and the ALR SX PowerFlex's ISA video slowed down somewhat when upgraded. Overall, the Everex EV634 Super VGA board, with its Tseng chip set and 1MB of video RAM, produced the fastest video at 0.6 seconds, contrasted with a lethargic 3.68 seconds for the Integrated Chips and Technologies chip set in the Reply Model 32.

■ The 80386 and 80486 Instruction Mix benchmark tests time a series of tasks specific to the 80386 and 80486 chips, respectively. Since these tests show how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, faster times mean better overall computer performance.

■ The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

■ The disk score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

The Direct to Screen benchmark test indicates the speed of the video adapter memory. A good score indicates that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.

HIGHLIGHTS

1 Dell: Processor

In 386 operation, the Dell System 333P's upgrade slot can be filled by a blank jumper card or a 32K RAM cache module. We tested both 386/33 configurations and found that the cache is clearly necessary for optimal performance.

2 Everex: Memory, Video

This system uses a 256K on-board RAM cache for both 386 and 486 configurations; the result is better-than-average memory times. Exceptional video performance derives from: a Super VGA card with 1MB RAM using a Tseng Laboratories chip set.

3 ALR BusinessVEISA: Disk

The only system in the group equipped with an ESDI drive, the ALR BusinessVEISA yielded above-average performance, but not as good as the MCA configuration with an IDE drive.

4 ALR Modular Processor System: Disk

The Western Digital Caviar IDE drive used in this system is rated at below 18 milliseconds, accounting for above-average disk performance.

HOW WE TESTED

In testing these ten upgradable PCs, we used PC Magazine Labs' Hardware Performance Tests, Release 5.6, with video and system shadowing enabled wherever possible. Buffers were left at their default values. We used no software disk caches when performing disk benchmark tests, and no RAM-resident programs were loaded for any tests. The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds, so take this into account when making purchasing decisions based primarily on speed.

Lower scores represent better performance.

	Processor (seconds)	Memory (seconds)	Disk (seconds)	Video (seconds)
Copam B Series (386SX/16)	4.52	0.69	63.25	2.03
* 386SX/16 (historical average)	4.38	0.70	74.45	3.66
* 386SX/20 (historical average)	3.26	0.52	62.28	2.01
AST Premium II (386SX/20)	3.11	0.47	50.22	2.63
Tandon Option (386SX/20)	3.06	0.44	59.30	1.32
ALR SX PowerFlex (386SX/20)	3.01	0.44	59.77	1.76
* 386/25 (historical average)	2.33	0.39	62.11	3.30
* Compaq Deskpro 386/25e	2.26	0.42	59.89	0.94
Amkly 386/25e	2.16	0.33	65.58	2.09
** ALR SX PowerFlex (486/25)	1.78	0.41	60.01	2.80
Reply Model 32 (386/33)	1.75	0.28	70.60	3.68
Copam B Series (386/33)	1.71	0.30	61.88	1.87
* 386/33 (historical average)	1.67	0.31	53.84	2.01
ALR BusinessVEISA (386/33)	1.65	0.31	50.62	1.93
Dell System 333P (386/33)	1.65	0.25	63.39	1.21
AST Premium II (386/33)	1.63	0.25	49.03	2.63
ALR Modular Processor System (386/33)	1.62	0.25	48.56	1.92
Everex STEP 386 (386/33)	1.61	0.22	59.33	0.49
** Copam B Series (486/25)	1.44	0.28	61.38	1.65
** 486/25 (historical average)	1.45	0.25	51.11	2.35
** Amkly 486/25e	1.43	0.25	64.70	2.31
** Tandon Option (486/33)	1.15	0.22	57.89	1.04
** AST Premium II (486/33)	1.13	0.20	48.56	2.63
** Reply Model 32 (486/33)	1.09	0.22	70.09	3.68
** 486/33 (historical average)	1.08	0.18	50.37	1.56
** ALR BusinessVEISA (486/33)	1.07	0.19	50.16	1.92
** ALR Modular Processor System (486/33)	1.07	0.17	47.95	1.87
** Dell System 433P (486/33)	1.08	0.17	62.53	1.21
** Everex STEP 386 / InSTEP 486 (486/33)	1.07	0.17	59.09	0.60

* Reported for comparison.

** 80386 Instruction Mix test score reported for all 486 systems.

bination mechanical case and electronic keyboard lock.

The ALR BusinessVEISA requires no compromise when it comes to memory expansion. The first megabyte of 80-ns. RAM is comprised of eight DIP chips soldered onto the motherboard, as well as four SIMM sockets. Because the system uses interleaved page-mode memory, the SIMM sockets must all be filled with identical same-capacity SIMMs, either 256K, 1MB, or 4MB, for on-board memory capacities of 1MB (no SIMMs installed), 2MB, 5MB, or 17MB. An optional \$199 proprietary memory expansion card has eight more SIMM sockets, increasing the BusinessVEISA's maximum to 49MB.

The upgrade process is simple: Just pull out the old board and plug in the new one, with no hardware switches or software configuration requirements. The removable boards hold only the processor and math coprocessor socket.

As borne out by PC Magazine Labs' benchmark tests, there is no performance degradation using the upgradable ALR BusinessVEISA systems, which perform just as well as comparable nonupgradable



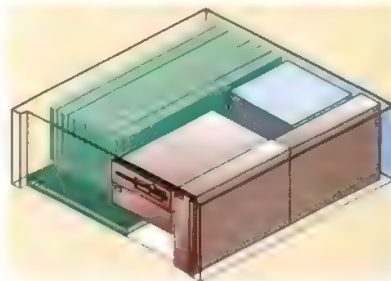
ALR systems. When you buy an ALR system you get a fast computer, whether it's an upgradable design or not.

NOT CHEAP

The ALR BusinessVEISA comes with a 33-MHz 386 processor board and accepts 25-MHz and 33-MHz 486 upgrades. For a 33-MHz 386 system with 5MB RAM, 64K RAM cache board, 80MB IDE hard disk, 1.2MB floppy disk drive, and Super VGA display subsystem, you'll pay \$3,795. This price does not include DOS, however, since ALR normally does not sell the operating system.

Identically configured systems with 25-MHz 486 or 33-MHz 486 processor boards cost \$5,095 or \$5,495, respectively. Our test system used a Seagate EISA 154MB hard disk drive with a Western Digital floppy/hard disk EISA controller that has a 64K buffer. It lists for \$6,142 with a 33-MHz 386 card, \$7,842 as a 25-MHz 486, and \$8,142 with a 33-MHz 486.

Retail prices for upgrade boards are \$1,995 and \$2,695 for the 25-MHz 486



ALR BusinessVEISA

Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 800-444-4257, 714-581-6770.

Processor and system prices (tested configurations): 386/33, \$6,142; 486/25, \$7,842; 486/33, \$8,142.

Memory and processor RAM cache: 5MB 80-ns. DIPs and SIMMs, 64K cache.

Disk drives and controller: Seagate 18-ms. 154MB ESDI hard disk, Western Digital controller, 1.2MB floppy disk drive.

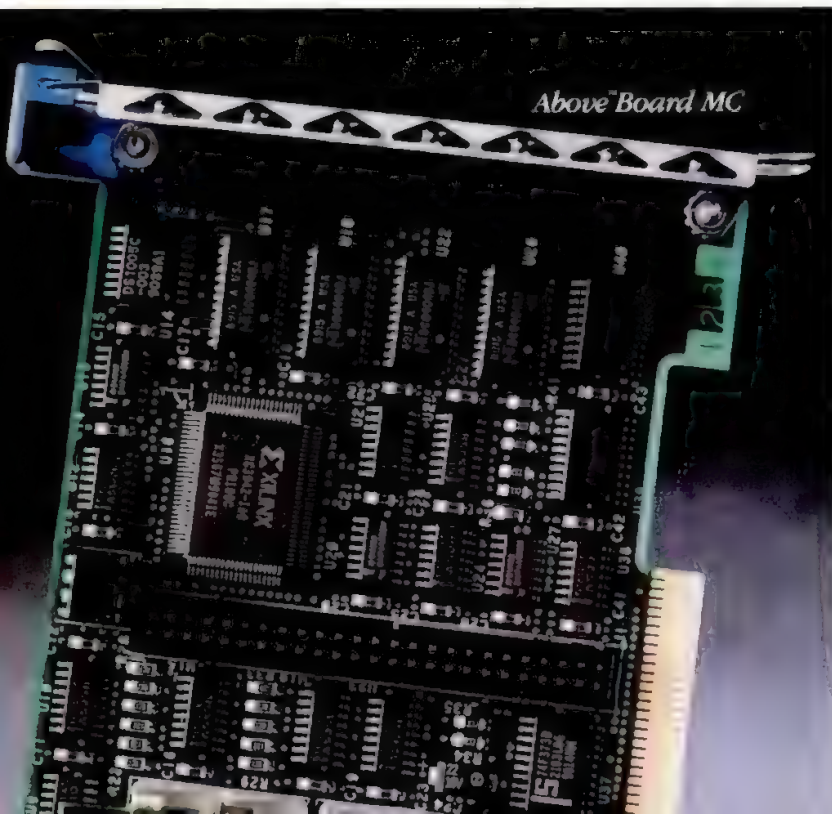
Display: Western Digital 256K SVGA adapter, 14-inch ALR monitor.

Software: DOS 4.01.

Processor options: 486/25, \$1,995; 486/33, \$2,695.

CIRCLE 604 ON READER SERVICE CARD

Board up your Windows.



Adding memory will boost Windows® 3.0 performance. And for an IBM® Micro Channel® PS/2®, the best way to do that is with Intel's new Above™ Board MC. Now you can add up to 32MB of power to 16- and 32-bit PS/2s, and run Windows applications up to four times faster. So go to your dealer and buy your Above Board today. And take advantage of our board-certified offer.

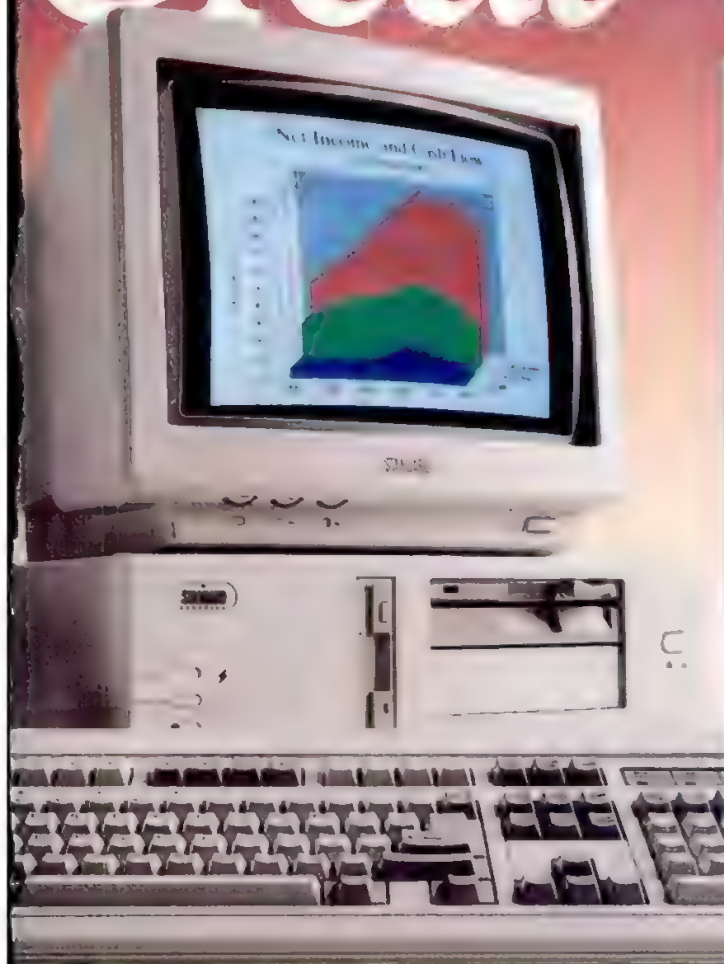
Special offer! Get Micrografx® Draw Plus® free (\$229 value), or Charisma® presentation software for just \$59.95 (a \$495 value), with the purchase of any Intel Above Board.

intel
The Computer Inside.®

For free information on maximizing Windows 3.0, call (800) 525-3019 for Doc #9958. For Above Board information, call (800) 538-3373. ©1991 Intel Corporation. Above is a trademark of Intel Corporation. *Other product names are trademarks of their respective owners.

CIRCLE 355 ON READER SERVICE CARD

Great Values!



486▼33 System

- ▼ 64KB cache
- ▼ 4MB RAM
- ▼ 16-bit VGA with 1MB
- ▼ 14" non-interlaced Super VGA color monitor
- ▼ 210MB 15ms IDE hard drive
- ▼ 1.2MB & 1.44MB floppy drives
- ▼ 1 parallel, 2 serial and 1 game port
- ▼ 101-key enhanced keyboard
- ▼ Built-in co-processor
- ▼ New MS DOS 5.0
- ▼ Windows 3.0 & Hi-Res mouse
- ▼ FREE one year on-site service†
- ▼ 2-year warranty
- ▼ FREE 2400 baud modem

\$2,795

386▼33 System

- ▼ 64KB cache
- ▼ 4MB RAM
- ▼ 16-bit VGA with 1MB
- ▼ 14" non-interlaced Super VGA color monitor
- ▼ 130MB 15ms IDE hard drive with 64KB cache
- ▼ 1.2MB & 1.44MB floppy drives
- ▼ 1 parallel, 2 serial and 1 game port
- ▼ 101-key enhanced keyboard
- ▼ New MS DOS 5.0
- ▼ Windows 3.0 & Hi-Res mouse
- ▼ FREE one year on-site service†
- ▼ 2-year warranty
- ▼ FREE 2400 baud modem

\$1,995

Ask about our other packages: 386SX▼16 \$1395, 386SX▼20 \$1695
386▼25 \$1895, 386▼40 \$2195, or 486SX▼20 \$2495



At Standard, we know a low price isn't the only thing you look for in a computer. Support is just as important. Standard has one of the strongest service and support policies in the business.

We give you a 30-day, no-questions-asked, money-back guarantee; free TRW on-site service†; lifetime toll-free technical support. That's in addition to our two-year parts and labor warranty and our new 24-hour, 365-day BBS with access to updated drivers and technical assistance.

With all this service and support, great prices and top performance too, you can be confident Standard computer is the best value available.

Call Standard Computer today. We'll prove that giving you more – for less – is just our standard way of doing business.



STANDARD

C O M P U T E R

12803 Schabaram Avenue, Irwindale, CA 91706
Phone: 818/337-7711 FAX: 818/337-2626

PC
MAGAZINE

The Standard 486 33 combines the blistering performance of a 486 with a price that undercuts many less capable 386 machines.
PC Magazine February 12, 1991

800/662-6111



FREE 2400 baud Modem!

with purchase of desktop system

Limited offer. Call Now, while supply lasts!

To introduce our

NEW Bulletin Board Service.

- ▼ 24-hour technical support 365-days a year
- ▼ Instant access to updated drivers and files
- ▼ Nationwide E-Mail and conferencing
- ▼ Access to 1000's of files and applications like:
 - ✓ Microsoft windows applications
 - ✓ Games for all ages
 - ✓ System utilities and diagnostics
 - ✓ Home productivity programs
 - ✓ Graphics, video and animation files

Our Commitment To You.

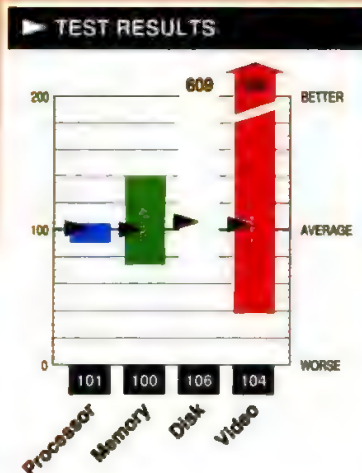
- ▼ 2-year parts & labor warranty
- ▼ 30-day money back guarantee
- ▼ FREE one year of TRW on-site service
- ▼ Lifetime toll-free technical support
- ▼ 24-hour Bulletin Board for technical support
- ▼ Express parts replacement
- ▼ No surcharge for credit cards
- ▼ Company PO's accepted
- ▼ Leasing program available
- ▼ APO/FPO orders welcome
- ▼ Novell Gold Authorized Reseller
- ▼ Certified NetWare Engineer on staff
- ▼ Custom configurations available

For most locations.

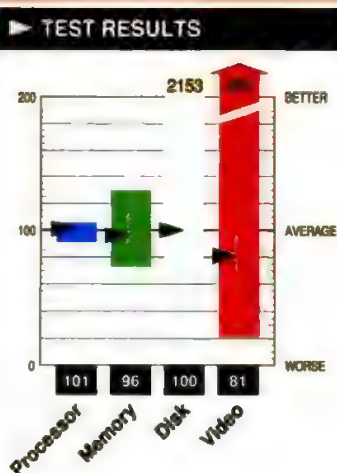
CIRCLE 163 ON READER SERVICE CARD

ALR BusinessVEISA

Processor: 386/33



Processor: 486/33



In Short: Upgradable from 386/33 to 486/25 or 486/33, the ALR BusinessVEISA's processor upgrade design accents ease and speed. Though upgrade boards are somewhat costly and the small-footprint case limits expansion to four drives, there's no other reason to hesitate if you're considering an upgradable system.

and 33-MHz 486 boards, respectively. These hefty upgrade prices are somewhat softened by a \$200 trade-in for a 33-MHz 386 processor board or \$700 for a 25-MHz 486 board. This lowers the cost of upgrading a 33-MHz 386 system to a 25-MHz 486 to \$1,795. To bump the same system to a 33-MHz 486 will cost you \$2,495. Going from a 25-MHz 486 to a 33-MHz 486 costs \$1,995. Remember that these are all list prices, with some discounts likely.

In order to obtain your processor rebate, you'll need to ship your old card back to ALR, with proof of purchase of the upgrade. But according to ALR, companies that make upgrades often forgo the trade-in rebate and keep the slower boards to use as spare parts or to trade down to other BusinessVEISA systems with slower boards.

PORT LIMITATIONS, BLOCKED SLOTS

The BusinessVEISA has six standard and three proprietary expansion slots. The proprietary slots hold the processor board, the optional external RAM cache board, and optional memory expansion boards. The cache and memory boards are both half-length, and because they block two of the standard slots, those standard slots

must also use half-length cards if both the cache and memory expansion boards are installed. The standard slots comprise two 16-bit ISA slots and four 32-bit EISA slots. Luckily, the slots blocked by the cache and memory boards are the BusinessVEISA's only two 16-bit slots, which are more likely to hold half-length boards.

At first look, the BusinessVEISA case appears to lack the requisite array of I/O ports: It has a parallel port and a mouse port, but only one serial port and no second serial port option. However, this configuration makes sense for systems used where space is at a premium, because space-conscious users will probably install an internal modem, avoiding common use of the single serial port.

ALR systems are available solely through dealers and value-added resellers. A one-year parts-and-labor warranty is standard, with optional warranty extensions and on-site service contracts available from the

system reseller. Warranty service is obtained from the factory, from ALR-authorized service centers, and from Intel service centers.

This is a well-thought-out system design with no trade-off in performance. Certainly it's less expensive to buy the processor level you need at the start than upgrade later, but ALR's performance edge and upgrade ease both argue loudly in favor of this well-engineered system.

ADVANCED LOGIC RESEARCH INC.

ALR Modular Processor System

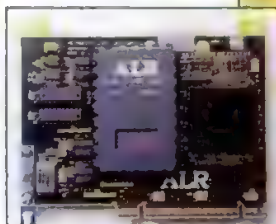
by Wendy Dugas Pérez

ALR offers system options in all three architectures: EISA, ISA, and MCA. While its EISA and ISA systems (both reviewed in this round-up) are already well established, the company's MCA line—the ALR Modular Processor System (MPS)—is shaping up fast.

We reviewed the MPS 386/33 (with cache) and the MPS 486/33; however, ALR offers numerous MCA upgrade paths. You can begin at a 386/33, move up to a 386/33 with cache, then to ALR's 486/25, and finally to the 486/33. ALR has also recently introduced a 486SX.

An MPS system matching our standard configuration costs \$5,093 (for a 386/33 with 5MB of RAM, 120MB IDE hard disk, VGA card and monitor, one parallel and two serial ports). DOS is not included. The 386/33 cache upgrade processor card, which we tested, is available for \$799, a 486/25 for \$1,995, and the

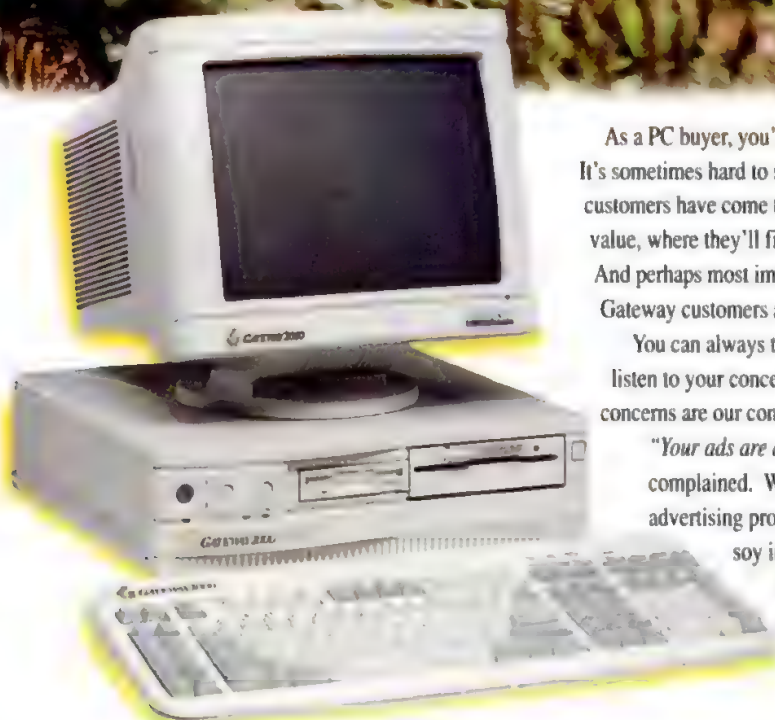
One of few MCA systems, the ALR Modular Processor System upgrades from 386/33 to 486/33.



Which PC
Is Your
Only
Logical
Choice?

GATEWAY

BECAUSE IT'S A



As a PC buyer, you're constantly confronted with wild claims and overgrown prices. It's sometimes hard to see the forest for the trees in the PC jungle. But Gateway 2000 customers have come to know they can trust us. They know Gateway is a sanctuary of value, where they'll find the best prices on quality systems backed by excellent service. And perhaps most importantly, they know we'll treat them as the special friends all Gateway customers are.

You can always tell if a company truly values its customers by the way its people listen to your concerns and how the company responds. At Gateway, your concerns are our concerns. For example:

"Your ads are a waste of precious natural resources," more than a few customers complained. We listened. And we're responding by using recycled paper in our advertising program. You'll also see us switching from petroleum-based inks to soy inks in our printing soon.

Several customers thought we should down-size our ads to spend less on advertising and to use less paper. From a business standpoint, we didn't want to do that because the ad you're reading is our only store. And we've never exceeded our ad budget, which is a tiny percentage of sales. But we aren't ignoring these customers' concerns. Even though the paper

AY 2000

JUNGLE OUT THERE



companies we deal with have excellent reforestation programs, we became a Global Releaf® corporate sponsor. The money we contribute to this American Forestry Association project will plant over 15,000 new trees in the next 12 months.

In the PC jungle, Gateway 2000 is a sanctuary of value, where your concerns are our concerns.

It's literally a jungle out there at the Organization for Tropical Studies (OTS), a consortium of 52 prestigious universities and research institutions. OTS uses Gateway 2000 systems in Costa Rica to do research in tropical rain forests. Don Stone, OTS's Executive Director, decided to put Gateway computers in the jungle

after confirming their great value and reliability with Susan Gerbeth-Jones, Data Processing Specialist at Duke University, one of OTS's member institutions. Don asked Susan if she had ever heard of a company called Gateway 2000, to which she replied, "Why, yes I have - here's one right here." Susan said she's had her Gateway at Duke for over a year. "Everything about it is solid and it runs smoother than any other computer in the department," she commented. "I feel Gateway 2000 has more features for the money."



Susan Gerbeth-Jones
Duke University



GATEWAY

BECAUSE WE'VE STOOD



Gateway 2000 has stood the test of time. *PC Week's* Sam Whitmore includes Gateway 2000 in a very short list of successful computer makers. "The common themes: high-value, low-cost products. Close contact with customers. *And sincerity over time.* Buyers value vendors that have priced their products fairly from the outset, not just in reaction to dwindling market share and impractical cost structures."

We know you also value a vendor's stability over time. A dentist from Watertown, South Dakota, wrote to us recently for assurance that his Gateway computer won't become an "orphan" someday. Nobody wants to buy a PC today and find out tomorrow the manufacturer went out of business.

When you buy a Gateway 2000 computer, you can be assured that you're doing business with one of the largest and most successful PC direct marketers in the nation. In the July 1 issue of *Business Week* magazine, Gateway is ranked as the third largest direct market computer manufacturer in the nation based on 1990 revenues of \$275 million. In just two quarters of 1991, we've nearly exceeded 1990 revenues. Many

AY 2000

THE TEST OF TIME



companies would envy our June 30 balance sheet, which shows current assets outweighing current liabilities by more than 2 to 1 and our equity being more than 10 times our long-term debt.

What that means is your computer won't become an orphan; we'll be here to honor your 30-day money-back guarantee and one-year warranty on parts and labor; we'll be here to provide lifetime telephone technical support and bulletin board services; and we'll grow with you, bringing you the best value in the highest technology computer products for years to come. Gateway 2000 — we've stood the test of time. We're going to be here for you.

Gateway 2000 has stood the rigorous tests of Time Customer Service in Tampa, Florida.

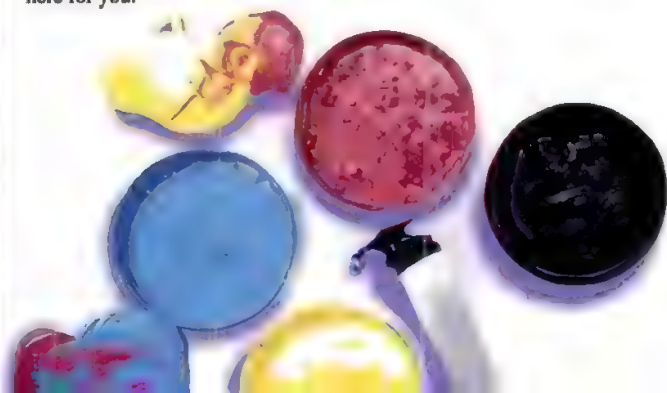
TCS now has over 250 Gateway systems in use. Some of the Gateways are used in mission critical business applications such as Target Select. Target Select is a process whereby a magazine is built and customized with inkjet printing at bindery time. But TCS's Andy Rifkin, Director of Advanced Technologies, didn't buy all those Gateways without careful consideration.

"We use Gateways in mission-critical applications," said Andy. "If the systems running our application go down, we're out of business. That's why we do extensive testing before we buy. We have at least one PC from every computer company ever in existence," he continued. "These systems have all been through our testing process, but the Gateways have unquestionably been our top-performing PC's with a failure rate less than 2%."

Andy said initially it was risky for him to recommend Gateway 2000 over the more traditional corporate computer suppliers. "But Gateway came through for Time Customer Service, at a fraction of what we had been paying for PC's."



*Andy Rifkin
Time Customer Service*



GATEWAY

BECAUSE WE'RE TIRELESS IN OUR



Gateway 2000's tireless efforts to bring you the best value have resulted in unbeatable features, performance, and prices.

Gateway was one of the first companies to make a non-interlaced color monitor standard with 386DX and 486 systems. No increase in price.

Other custom keyboards pale compared to Gateway's 124-key programmable AnyKey™. And unlike other custom keyboards, the AnyKey is standard with all

Gateway 2000 systems. No increase in price.

Gateway 2000 was one of the first companies to break the \$4,000 barrier in 486 system prices. Now our 486 models are selling for prices you'd expect to pay for 386 systems. While some companies are promoting 486SX models as the affordable 486, Gateway is offering you a true 486 at a better price.

On all SX and DX systems, a Microsoft® mouse and Windows™ 3.0 are standard. MS DOS® 5.0 comes standard with all systems. With Gateway, you don't pay extra for the tools you need to get the most out of your computer.

Gateway customers told us they liked the price and performance of their systems, but they weren't crazy about the "plain vanilla" looks of Gateway computers. So we introduced an entirely redesigned product line with unique, contemporary-looking systems. No increase in price.

Our customers told us they wanted a small footprint model with room for expansion. So we introduced a space-saving mini desktop model for 286 and 386SX systems with five 16-bit slots open in the standard configuration.

Customers are telling us they want a Gateway 2000 notebook. The best is yet to come.

Gateway 2000

EFFORTS TO GIVE YOU THE BEST VALUE



We're tireless in our efforts to offer you the best value in the industry because we're on a mission. Our mission is to make Gateway 2000 the only logical choice in microcomputers. To achieve this ambitious goal, we must continue giving you what you want: great prices on quality, high-performance products, backed by excellent support policies and our award-winning technical service people. With Gateway, you can have it all. In the race for leadership in the computer industry, the real winner is you!



Gateway 2000's tireless efforts to offer the best value in the industry convinced the world-famous **Pirelli® Armstrong Tire Corporation** to buy Gateway computers. "They never raise their prices," said Gary Boyd, Controller for Pirelli, from his office in Hanford, California. "Gateway is continually improving the quality of their products and services, and yet their prices keep going down."

Pirelli uses Gateway systems in every department. "The engineers in particular love them," Gary commented. "They run Gateway 486 systems as CAD workstations to design products, equipment and plant facilities."

Pirelli people are taking Gateway systems home with them, too. Last year the company hosted a computer fair to give employees a chance to compare various computer brands on the market. "Our factory manager bought a Gateway for home, as did the manufacturing manager, four of the engineers and myself, just to name a few," said Gary. "Even with all the competition at the fair, Gateway 2000 clearly offered the best value."



Gary Boyd
Pirelli Armstrong
Tire Corporation

GATEWAY2000

16MHZ 286 VGA

- 80286 Processor
- 2 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey™ Keyboard
- MS DOS® 5.0

\$1395

16MHZ 386SX VGA

- Intel® 80386SX Processor
- 2 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 40 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey Keyboard
- Microsoft® Mouse
- MS DOS 5.0
- MS Windows™ 3.0

\$1495

20MHZ 386SX CACHE

- Intel 80386SX Processor
- 32K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 512K
- 14" Crystal Scan 1024 Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 1 PS/2 Mouse Port
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$1795

25MHZ 386SX

- Intel 80386 Processor
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 80 MB 17ms IDE Drive with 32K Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$1995

BEST BUYS

- Get our 33 MHz 386 Cache system, same configuration as listed, with a 120 MB IDE hard drive instead of the 200 MB drive.

\$2395

- Same features as our 33 MHz 486 Cache system except this machine has 4 MB RAM, instead of 8, and a 120 MB IDE hard drive, instead of the 200 MB drive in our standard configuration.

\$2845

33MHZ 386 CACHE

- Intel 80386 Processor
- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$2695

25MHZ 486 CACHE

- Intel 80486 Processor
- 64K Cache RAM
- 4 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$2995

33MHZ 486 CACHE

- Intel 80486 Processor
- 64K Cache RAM
- 8 MB RAM, Expands to 64 MB
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

\$3395

The Extras – That Don't Cost Extra At Gateway

- One-year warranty on parts and labor
- Replacement parts shipped quickly via overnight shipping at no charge
- 30-day money-back guarantee
- Lifetime toll-free technical support from the service organization that won PC World's Service Excellence Award
- Free on-site service to most locations
- Free bulletin board technical support

- C.O.D. terms and major credit cards honored
- Net 30-day credit terms available to qualified commercial customers
- Leasing options available to qualified commercial customers
- MS DOS 5.0 is standard; versions 4.01 and 3.3 are available at no extra charge
- The programmable AnyKey keyboard is standard; a 101-key keyboard is also available at no extra charge

All prices are subject to change. Prices do not include shipping.

 Printed on recycled paper.

 Corporate Sponsor – a program of the

American Forestry Association, Box 2000, Washington, DC 20013. Call us for information on how you can support Global Releaf.

Sales Hours: 7am-10pm Weekdays, 9am-4pm Saturdays (Central Time)
Service Hours: 6am-Midnight Weekdays, 9am-2pm Saturdays (Central Time)



"You've got a friend in the business."

8 0 0 - 5 2 3 - 2 0 0 0

610 Gateway Drive • N. Sioux City, SD 57049 • 605-232-2000 • Fax 605-232-2023



Now Toll-Free
From Canada!

BECAUSE IF YOU BOUGHT ANYTHING ELSE

You'd Read This And Weep

The Programmable AnyKey™ Keyboard

Standard with all Gateway 2000 systems

We call our new 124-key custom keyboard the AnyKey because any key can be programmed to perform any function – anything you can imagine, quickly and easily. Or you can remap the keys to create your own keyboard layout. It's a revolutionary new concept designed to let you talk to your computer in a very personal way. The AnyKey includes a numeric pad and a separate, full-function cursor pad with diagonal keys, plus two sets of function keys located along the top and left side. The AnyKey's versatility is rivaled only by its simplicity. You can learn to program it in just a few minutes. If you goof, you can easily reset the keyboard to a normal configuration. And if you hate the idea of programming anything, you'll still love the feel and extra keys on the AnyKey.



representative about our extensive line of optional components including hard drives, monitors, and graphics cards. All optional components and software are installed and tested with your system at our factory, disks and manuals provided.

Peripherals

We also sell and support a full line of competitively priced, quality name-brand peripherals, including dot-matrix and laser printers, tape backups, math coprocessors, and modems.



Just Add Your Favorite Programs

Gateway systems arrive ready to run. The hard drive is formatted and the software that comes with each system is loaded. All you have to do is install your favorite applications. Software diskettes and comprehensive hardware and software manuals are included in your package from Gateway 2000. And by the way, your system comes in our new cow-spotted box. Because our first ads showed a picture of the family cattle farm, many customers know us as "the cow company." We haven't forgotten the cows.



The Crystal Scan 1024NI Color Monitor

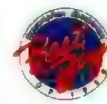
Standard with all Gateway 2000 386DX and 486 systems

The new Crystal Scan 1024NI is a non-interlaced VGA color monitor designed for flicker-free video display. The 1024NI has a 14-inch non-glare tube, 0.28mm dot pitch with resolution up to 1024 x 768.

Custom Configurations

Every Gateway 2000 system is custom-built by skilled Midwest technicians to your specifications. If our standard configurations don't suit your needs, we'll add or subtract features for you. Ask your sales

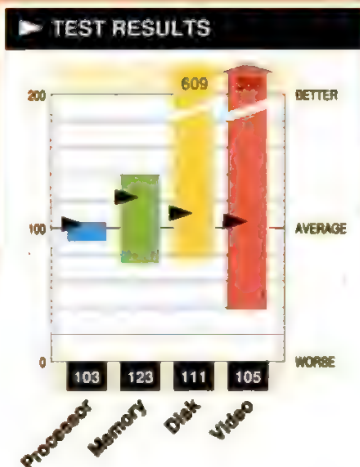
Components and peripherals are sold separately only to Gateway 2000 customers



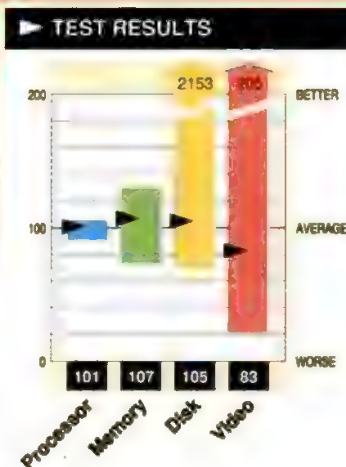
8 0 0 - 5 2 3 - 2 0 0 0
610 Gateway Drive • N. Sioux City, SD 57049 • 605-232-2000 • Fax 605-232-2023

ALR Modular Processor System

Processor: 386/33



Processor: 486/33



In Short: You have two options with the Micro Channel-based ALR Modular Processor System: a 33-MHz 386 or 33-MHz 486. In either case, the upgradable design makes ease of use a priority, with little sacrifice in performance. ALR is one of the few players in the MCA arena—and the only vendor that lets you choose among three bus architectures.

486/33 for \$2,695. These list prices are high compared with those of other systems in our review group, even after you factor in a dealer discount.

MINIMALIST DESIGN, MAXIMUM PERFORMANCE

ALR designs its processor cards with only the necessities on-board: the CPU and a coprocessor socket. In the case of the 386/33, ALR makes room for Intel's Smartcache—a 16K cache chip that offers performance a on par with a 128K cache.

This minimalist approach enables you to perform the upgrade with little fuss: Simply take the old card out of the slot and insert a new one. No need to switch memory from card to card (memory resides on the motherboard as well as a proprietary 32-bit card).

ALR does offer a buyback plan for your old processor cards. You'll receive \$200 upon return of a 386/33 or 386/33 with cache, \$100 for a 486SX, and \$700 for a 486/25. Although these are not astronomical sums, they do help offset the cost of your new processor card, and because ALR claims it does not reuse the cards, this option is provided to the buyer just as a service.

Unlike the case with other vendors'

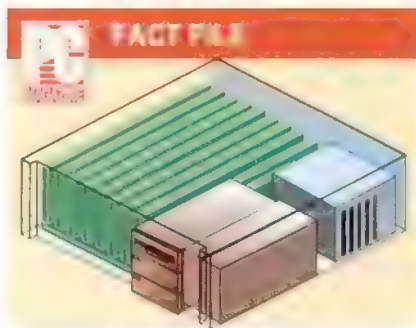
machines, you won't be sacrificing performance with these systems for choosing the flexibility of an upgradable architecture. And unlike ALR's ISA-based 486/DX, its MCA systems were the top

two among upgradables on processor, memory, and disk benchmark tests.

The greatest limitation of ALR's small-footprint system is not so much its five 3.5-inch drive bays as its current lack of 5.25-inch drive bays. Just as most MCA clone manufacturers followed in IBM's footsteps by standardizing on 3.5-inch drives, most are now following IBM's departure from this on the Models 90 and 95 as well. Unlike their predecessors, these two units include 5.25-inch drive bays.

The MPS series, however, currently suffers from a common MCA problem: It has only two 32-bit MCA slots. Although there are few 32-bit MCA cards available today, the MPS series will cramp your 32-bit expansion style. To offset these limitations, ALR offers an unusual feature in this system's processor cards: They are usable in both the ISA line and the MCA line, giving you even greater upgrade versatility. If problems arise, you should contact your dealer to take advantage of ALR's one-year parts-and-labor warranty, although you can also contact the company directly.

ALR's MCA systems prove that you don't have to sacrifice performance in order to achieve the versatility of an upgradable architecture. While the higher prices might hold you back, ALR's simple design, coupled with the fact that you can use processor cards across architectures (ISA and MCA), show that if your vendor is serious about upgradables, you can have the best of both worlds.



ALR Modular Processor System
Advanced Logic Research Inc., 9401
Jeronimo, Irvine, CA 92718; 800-444-4257,
714-581-6770.

Processor and system prices (tested configurations): 386/33, \$5,093; 486/33, \$7,593.

Memory and processor RAM cache: 5MB 80-ns. SIMMs, 16K cache.

Disk drives and controller: Western Digital 16-ms. 120MB IDE hard disk, 1.44MB floppy disk drive.

Display: ALR 256K SVGA adapter, ALR 14-inch monitor.

Software: DOS 4.01, Microsoft Windows 3.0.

Processor options: 486SX/20, \$4,495; 486/25, \$1,300.

CIRCLE 886 ON READER SERVICE CARD

ADVANCED LOGIC RESEARCH INC.

ALR SX PowerFlex

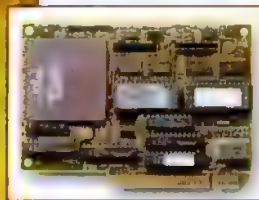
by Mario Baldasserini

ALR sent us its 386SX/20 and 486DX/25 upgrade modules to test with its upgradable ALR SX PowerFlex. The PowerFlex, which comes with a 286 chip on its motherboard, allows users to start with a 386SX/16 processor and upgrade as the need requires. This approach worked well for the 20-MHz 386SX module but stumbled badly when we tested the 486DX/25 because of its 16-bit memory-to-processor data path.

Indeed, ALR's last-place processor score shows the limitations of the 486DX modular design. Although the 486DX yields a performance increase over the 386SX/20, the increase is not equal to the performance of a true 486DX. Rather,

**Being
No. 1 in
PC Compatibles
didn't just
happen...**

COMPUTERS UPGRADABLE PCs



A 486 on a 286's motherboard is bound to suffer, and the ALR SX PowerFlex does.

for upgrade modules. There are six ISA expansion slots: one 8-bit and five 16-bit. The sixth slot (a 16-bit) can accommodate only a half-length card because of the upgrade module located directly behind it. One parallel and one serial port are available, but no

mouse port.

The ALR Super VGA card occupies a single 16-bit slot. This board has 256K of dedicated RAM on the card, to support a maximum resolution of 800 by 600 pixels. Its performance was quite slow compared with that of others in our review group.

Our test system came with 5MB of 80-nanosecond RAM, an 80MB 18-millisecond-rated IDE hard disk, a 3.5-inch floppy disk drive, and a 230-watt power supply. A basic system comes with 1MB on the motherboard; up to 5MB can be added by using 1MB SIMMs. Upgrades are performed simply by removing the old module and plugging the new one into the proprietary slot.

the 486DX's performance rivals that of a 33-MHz 386DX. You may want to wait for ALR to introduce the 486SX/25 module, which should give you similar performance for less money.

The dimensions of the PowerFlex's small-footprint case are 6 by 14.5 by 16.5 inches. It can hold two 5.25-inch half-height drives and two 3.5-inch drives. With two 3.5-inch drives installed, both 5.25-inch half-height slots are open. Although there is no keyboard or case locks, the Phoenix BIOS does support password protection.

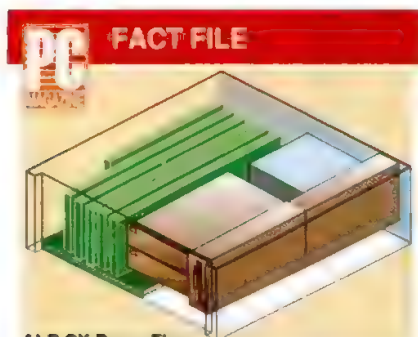
This system's 286-type ALR motherboard includes a 32-bit proprietary slot

FAST SX, SLOW 486

First we tested the 386SX/20 module, which includes an Austek A38202SX cache controller, 32K of cache, and a socket for an 80387SX. If you were buying this system without upgrading (and ALR claims that most people start out with the plain-vanilla 286 model), it would cost you \$3,243. Replacing your 386SX/16 module with a 386SX/20 module costs \$595. ALR's upgrade module buy-back plan gives you \$50 back on your 16-MHz 386SX module—not a very substantial refund compared with your original investment. There is no refund when upgrading from a 286 to a 386SX/20.

With its 386SX/20 module installed, the PowerFlex posted the best 20-MHz processor time of any unit in our review group. The system also performed nearly as well as the best nonmodular 20-MHz SXs. The hard disk, video, and memory results were all above average when compared with those of other desktop systems.

With a 486DX/25 module, the PowerFlex costs \$5,038. If you upgrade from either the 386SX/16 or the 386SX/20 to the 486DX/25, you pay \$1,995. The only difference is how much you receive from the buy-back plan. When upgrading from the 386SX/16 to the 486DX/25, you receive a \$395 rebate—equivalent to the



ALR SX PowerFlex

Advanced Logic Research Inc., 9401 Jeronimo, Irvine, CA 92718; 800-444-4257, 714-581-6770.

Processor and system prices (tested configurations): 386SX/20, \$3,243; 486/25, \$5,038.

Memory and processor RAM cache: 5MB 80-ns. SIMMs, 32K cache.

Disk drives and controller: Western Digital 18-ms. 80MB IDE hard disk, 1.44MB floppy disk drive.

Display: Western Digital 256K SVGA adapter, ALR 13-inch monitor.

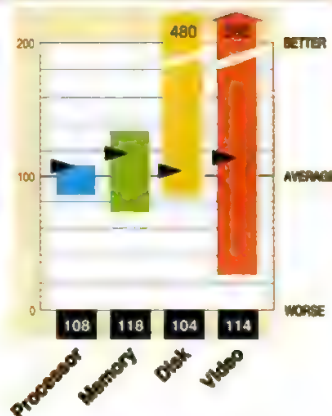
Software: DOS 4.01.

Processor options: 386SX/16, \$395.

ALR SX PowerFlex

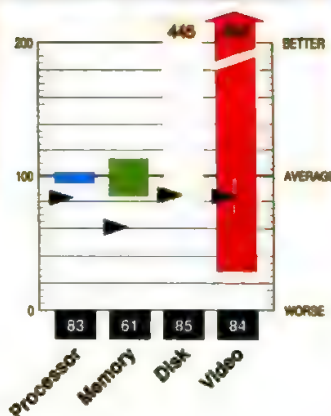
Processor: 386SX/20

TEST RESULTS



Processor: 486/25

TEST RESULTS



In Short: Designed as a 286, the ALR SX PowerFlex's 16-bit memory-to-processor data path caused 486 processor performance to fall far below that of any other 486 upgradable in this roundup. The system runs respectably as a 386SX, but upgrading will not be worth the investment. ALR has skipped the 386DX level on this system; options include a 20-MHz 386SX and 25- and 33-MHz 486s.

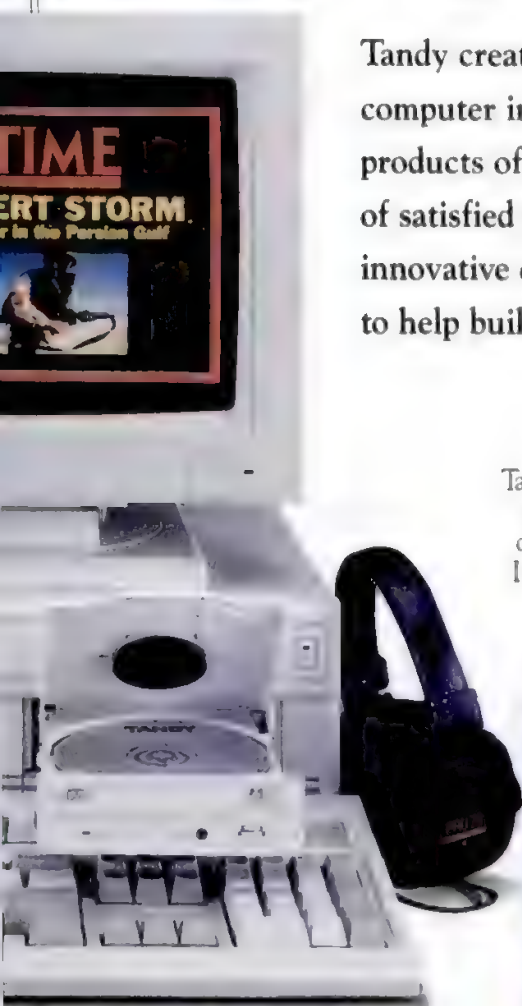
CIRCLE 606 ON READER SERVICE CARD

TANDY Engineered It

Tandy created the first mass-produced, nationally marketed personal computer in 1977, and has been a leader ever since. By manufacturing products of uncompromising quality, Tandy has built a large following of satisfied customers. And through innovative design, Tandy continues to help build the future:

The systems approach to home computing

Tandy software engineers designed special applications software for our home computer; IBM didn't. It's so easy to use, your success in using any Tandy® 1000 RL is actually guaranteed.



Tandy jointly developed the Multimedia PC Standard

And now Tandy is first to present a complete line of computers with the added dimension of this exciting technology. Tandy engineers even designed an affordable upgrade that brings multimedia to existing PCs.



Radio Shack
AMERICA'S
TECHNOLOGY
STORE SM

A DIVISION OF TANDY CORPORATION

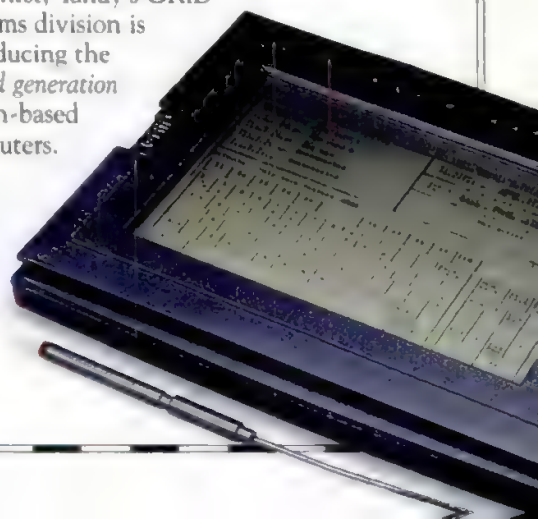


Pioneering the notebook PC industry

Tandy's Model 100 helped define this market in 1983. Users depend on Tandy for innovative features and a rugged case that's built to last.

Writing the future

While others prepare to ship their first, Tandy's GRiD Systems division is introducing the second generation of pen-based computers.



**SO TELL US
WHAT IT
CAN'T DO.**

Even though your keyboard will never look like this, your PC will act like it does.

Press a key and presto! You can send a message directly to millions of fax machines worldwide. Or exchange price quotes by electronic mail. Or send and receive an invoice via telex. Or have a purchase order delivered by overnight courier.

You can reach virtually anyone you need to reach—customers, suppliers, branch offices, your daughter in college—anytime, any-



where. And send thousands of pieces of information to hundreds of locations, all at the same time. And create spread sheets and contracts, graphics and files in Sidney, Ohio and send them to Sydney, Australia within seconds.

You'll be connected worldwide via one of the most modern telecommunications networks in the world. Even to systems that have nothing in common with yours. Because MCI® had the acumen, skill and foresight to make their system compatible with both public and private E-mail systems.

And, perhaps of paramount importance, you'll watch your business become more efficient, more exacting and much more productive than ever before.

To find out even more about your PC's potential, call **1-800-444-6245**. You'll receive a free MCI Mail® demo disk.*

Then you'll discover there's virtually nothing you can't do. Which means you can do what you always wanted to do, all along.

MCI Mail



original price of the 386SX/16 module. If you upgrade from the 386SX/20 to the 486DX/25, you get \$100. In any case, this 486 system's performance is disappointing, especially in the light of its cost.

ALR limits its 486DX/25 module to a 16-bit processor-to-memory path. Accordingly, this module performed slower than all desktop 486DXs and all of the 486s we tested. Even worse, the 486DX/25 module's video performance was slower than that of the 386SX/20 module, and its hard disk score was only slightly faster than that of the 20-MHz SX module.

ALR offers a one-year warranty on all parts and labor. This includes a toll-free phone support line active from 8:00 to 5:00, P.S.T., five days a week. A fax line operates 24 hours; answers are faxed back during working hours. ALR also maintains a BBS that allows you to download all of its utility software and drivers, and offers on-line 24-hour technical support.

With the 20-MHz 386SX module, the ALR SX PowerFlex shows its mettle on PC Magazine Labs' benchmark tests, but you still end up paying more than if you bought a standard desktop 386SX/20. And ALR's 486DX/25 module upgrade won't justify the additional cost with a comparable increase in performance. Wait for the 20-MHz 486SX.

AMKLY SYSTEMS INC.

Amkly 386/25e

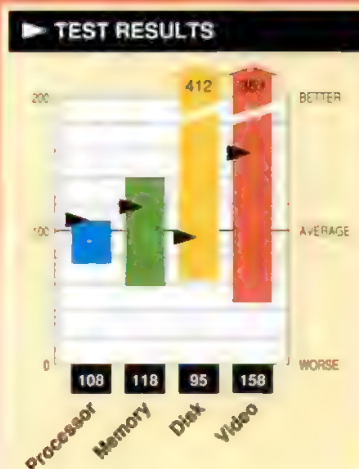
by John R. Quain



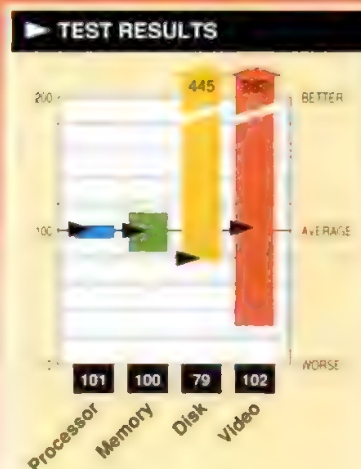
Introduced last April, Amkly System's first and only PC is the upgradable Amkly 386/25e, an EISA machine. Entering the tougher-than-leather PC clone market may

Amkly 386/25e

Processor: 386/25



Processor: 486/25



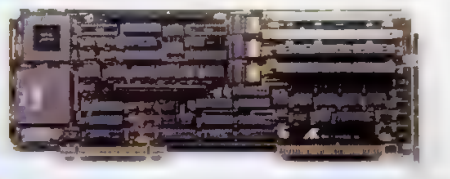
In Short: Amkly's modular and upgradable 386/25e gives you two choices only: a 25-MHz 386 or 25-MHz 486. Both turn in respectable processor, memory, and video scores, though their disk scores pale next to those of nonupgradable PCs in either class. Unlike any other vendor in this review, Amkly uses flash EEPROM to manage BIOS changes; this is just one way the fledgling company makes the upgrade procedure easy.

seem like risky business, but Amkly has had experience navigating the clone mine field: It was started in 1989 by Albert Wong, one of the cofounders of another clone veteran, AST Research.

On PC Magazine Labs' tests, the Amkly 386/25e didn't set any performance records, but this machine has an FCC Class B rating and a carefully executed design along with lucid, detailed manuals and the bus-mastering abilities of an EISA 32-bit

processor card, and a removable drive/power supply module. The system board uses an Intel chip set and a Trident Super VGA controller. All I/O ports (one parallel and two serial) are directly on the motherboard, as are both digital and analog monitor outputs and a PS/2-style mouse port as well.

The Trident VGA controller delivers respectable video performance and is capable of an eye-saving 72-Hz vertical refresh rate and 256 colors in Super VGA mode (the maximum noninterlaced resolution is 1,024 by 768 pixels). With new color palettes and vertical refresh rates being introduced nearly as often as new processors, motherboard-based video may seem short-sighted on an upgradable PC. But if you require the special talents of a Sierra or Edsun RAMDAC adapter, the Trident video chip set can be disabled.



Newcomer Amkly Systems' modular 386/25e gives you two choices: a 25-MHz 386 or 25-MHz 486.

PC. The small-footprint 386/25e is Amkly's basic system, with two upgrade processor cards available (a 33-MHz 386DX and a 25-MHz 486DX). The basic 386/25e system, which costs \$5,595, includes DOS 3.3 and a 14-inch Amkly VGA monitor that uses a Sony Trinitron CRT.

The Amkly 386/25e's interior is divided into three sections: motherboard,

REMOVABLE DRIVE AND POWER

Connected to the system board via a large DIN-style connector is a lift-out module containing the drive bays and power supply. By eliminating bundles of cables, it allows easy access to the portion of the motherboard that lies underneath. In this module is a low-profile 114MB Conner IDE hard disk, a 1.2MB TEAC floppy

Performance That Improves With Age.

The world of tomorrow is full of uncertainty. Your business, your competition, the economy and certainly computer technology. The AcerPower 486SX personal workstation is one of the safest paths you can take to the future...because Acer is the company behind it.

The AcerPower 486SX offers you today's latest technology with the easiest and least expensive means to future growth. Start with the new Intel486™ SX 20MHz processor whose performance exceeds today's 386DX-33MHz solutions – and whose cost is lower. Then tomorrow, when you need greater performance, upgrade your system to a 486DX-33MHz processor using Acer's ChipUp™ technology. By adding a CPU chip, not a module. No hardware or software changes. It can't get any easier or less expensive than this!

But, your growth path isn't limited to the CPU alone. Memory can be expanded to a full 98MB on-board using commercial SIMMs.

How about video? UltraVGA 1024 x 768 x 16 colors. Expandable to 256 colors by adding additional memory.

At a price of \$2,495* the AcerPower 486SX is an exceptional value. We've included MS-DOS® 5.0, Microsoft® Windows™ 3.0 and PS/2®-style mouse. Along with much more to get you started.

The AcerPower 486SX is the smart investment for where you are today and where you need to be tomorrow.

Acer 
Your Global Partner in Computing

Acer America Corporation
401 Charcot Avenue • San Jose, CA 95131
1-800-SEE-ACER

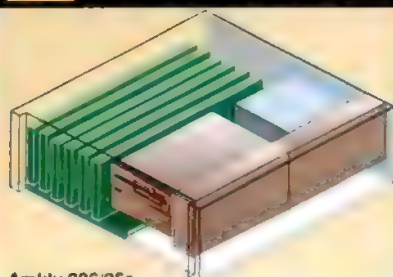
*MSRP. Based on September 1991 and does not change without notice.

Acer and the Acer logo are registered trademarks of Acer America Corporation. MS-DOS is a registered trademark of Microsoft Corporation. Windows is a registered trademark of Microsoft Corporation. PS/2 is a registered trademark of International Business Machines Corporation. Other product names and company names mentioned are registered trademarks of their respective companies.



FACT FILE

EDITORS' CHOICE



Amkly 386/25e

Amkly Systems Inc., 60 Technology Dr., Irvine, CA 92718; 800-367-2655, 714-727-0788.

Processor and system prices (tested configurations): 386/25, \$5,595; 486/25, \$7,895.

Memory and processor RAM cache: 4MB 70-ns. SIMMs, 16K cache.

Disk drives and controller: Conner 16-ms. 114MB IDE hard disk, 64K cache, 1.2MB floppy disk drive.

Display: Trident 1MB 1,024-by-768 adapter, Amkly 14-inch monitor.

Software: DOS 3.3.

Processor options: 486/25, \$2,300.

CIRCLE 607 ON READER SERVICE CARD

disk drive, and a 200-watt power supply. The IDE-controlled Conner drive turned in some of the slower access times in this group, but the integrated controller saves an expansion slot. The module has room left for one half-height drive and one 3.5-inch drive, but power users may wish they had more bays to work with.

FULL-LENGTH PROCESSOR BOARD

What makes the Amkly 386/25e upgradable is a full-length processor board that fits into a proprietary slot to one side of the six expansion slots. Along with the 25-MHz 80386DX chip, the card includes four SIMM slots and a 16K Intel 82395 cache controller. The standard 386/25e system comes with 4MB of DRAM. The SIMM slots can handle up to 16MB of either 70- or 80-nanosecond RAM. To increase the system's total memory to 112MB, Amkly offers a \$595 32-bit memory expansion board that can take up to 96MB of DRAM (8MB memory upgrade kits cost \$1,095).

In case you need to boost the performance of CAD applications, the 386 CPU card has a socket for a Weitek 3167 or Intel 80387 math coprocessor. Need both? Amkly will send you a special paddle card to accommodate them free of charge. However, you'll have to obtain the coprocessors through another dealer; Amkly doesn't sell them.

ABOVE-AVERAGE 25-MHZ PERFORMANCE

Compared with other upgradables in this roundup, the Amkly 386/25e is a 25-MHz machine in a largely 33-MHz crowd, so naturally it ran behind most of the 80386 pack. Compared with standard desktop machines in the same processor category, however, its processor test score was slightly above average. And even in this group, its memory score was far from the slowest. Consequently, choosing Amkly for upgradability doesn't mean sacrificing performance.

Choosing Amkly's full-CPU-card-upgrade design does mean that moving to the next computing level is going to be expensive—more so than in less ambitious designs that use simple CPU-only daughtercards. (Dell Computer's 33-MHz 486 daughterboard upgrade, for example, is only \$1,700.) Amkly charges \$2,300 to upgrade the 386/25e with its 25-MHz 80486 processor card. The 486 upgrade comes without RAM (the SIMMs can be transplanted from the 386 card), and the \$2,300 price requires the return of the old 386 card to the company. Amkly gives you 30 days to return the old card, minus the memory. The final price after upgrade: \$7,895—the same amount you would pay if you started out with the identically configured 486/25e system.

The company also offers an identically configured 33-MHz version of the 386 EISA machine for \$6,395. To upgrade from the 386/33e to the 486/25e costs \$1,500, bringing the total upgraded system cost to \$7,895. Amkly doesn't make you pay any penalty for choosing to start with one system rather than the other, though the company can't expect that someone buying such a new machine would upgrade it while these prices are still in effect.

If you can clear the monetary hurdles for the upgrade, the rest is a snap. Power-down the PC, remove the cover by unscrewing two thumbscrews on the back, switch CPU cards (remembering to install the SIMM DRAMs on the new board), replace the cover, and power up your new 486/25e. BIOS changes are performed automatically by the system's flash EEPROM. The process is nearly fool-proof. There isn't even any danger of losing the thumbscrews in the carpet; they stay in the cover.

The advantage of the Amkly design is

that it allows the user to make the CPU speed jump from 25 MHz to 33 MHz, while leaving room for upgrades to even faster processor speeds such as the 50-MHz 486 or Intel's anticipated 66-MHz 486. Putting such a substantial amount of system logic on the upgrade card enables the company to optimize performance on each upgrade and (as in Copam's machine, for example) ensure a full 32-bit path between the processor and memory. Tests performed following the 486 upgrade demonstrated that the rest of the unit had no difficulty dealing with the increased processor demands, offering slightly better-than-average test results in the shoulder-to-shoulder 486 crowd.

Amkly's options are meager at the moment, but what it does offer seems carefully chosen. The company offers toll-free technical support and a one-year parts-and-labor warranty. There's no doubt the Amkly 386/25e is a solid PC.

AST RESEARCH INC.

AST Premium II

by Greg Pastrick

AST Research's line of Premium II computers and FASTboard upgrades allow a streamlined approach to system enhancement. Built to plug into any one of three



AST Premium II

AST Research Inc., 16215 Alton Pkwy., Irvine, CA 92713; 800-876-4278, 714-727-4141.

Processor and system prices (tested configurations): 386SX/20, \$3,985; 386/33, \$4,615; 486/33, \$6,315.

Memory and processor RAM cache: 4MB 70-ns. SIMMs, 18K cache.

Disk drives and controller: Western Digital 14.4-ms. 210MB IDE hard disk, 1.44MB floppy disk drive.

Display: Western Digital 256K SVGA adapter, AST 14-inch monitor.

Software: DOS 3.3.

Processor options: 486SX/20, \$1,595.

CIRCLE 608 ON READER SERVICE CARD

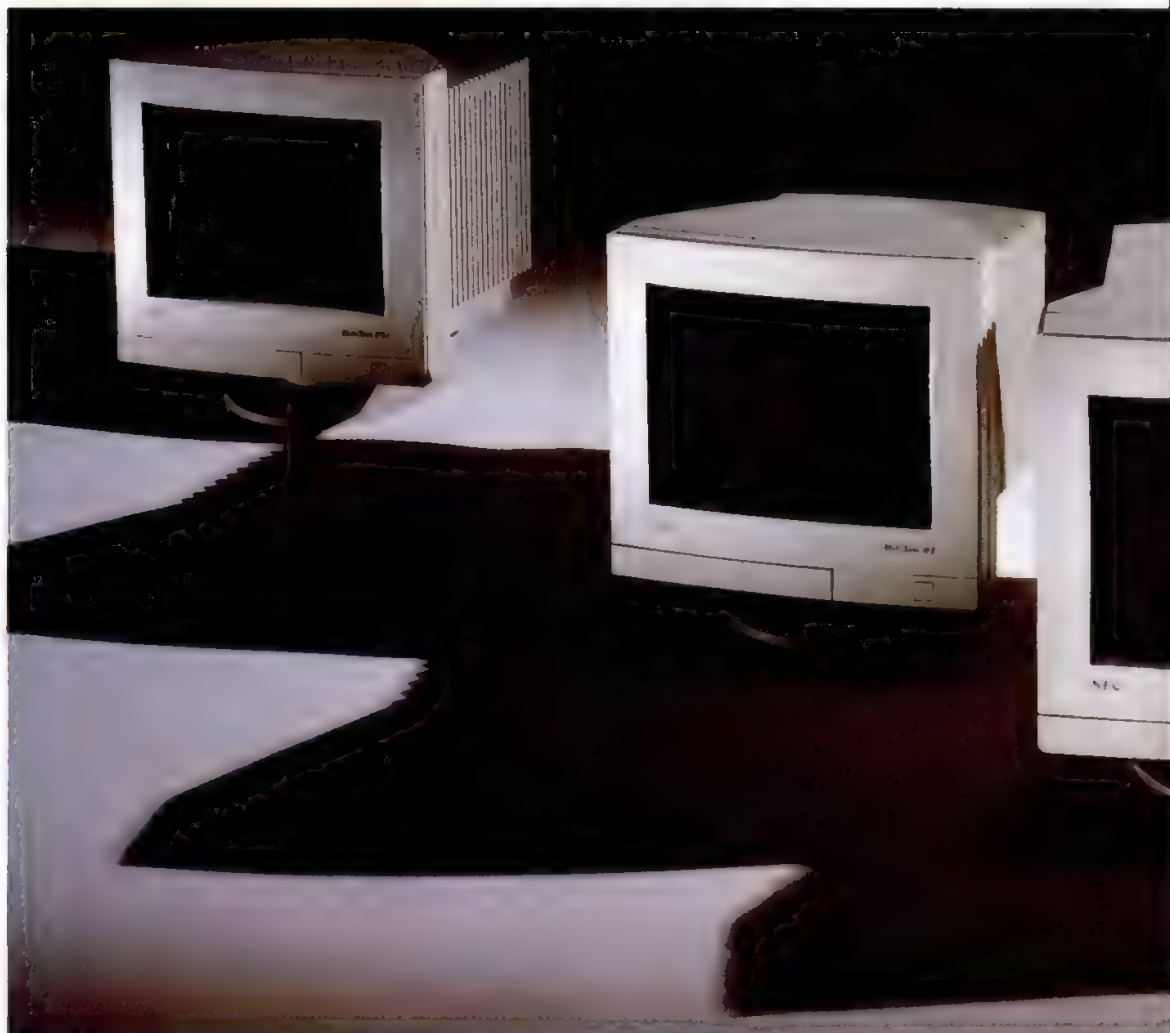


What do you want in a monitor?

How about



*Last year we invested
over \$3.6 billion
in research and
development.
In fact, our
investments exceed
the annual revenues
of most companies.
No wonder we were
able to design
such an
innovative
line of
monitors.*



The new MultiSync® monitors from NEC.

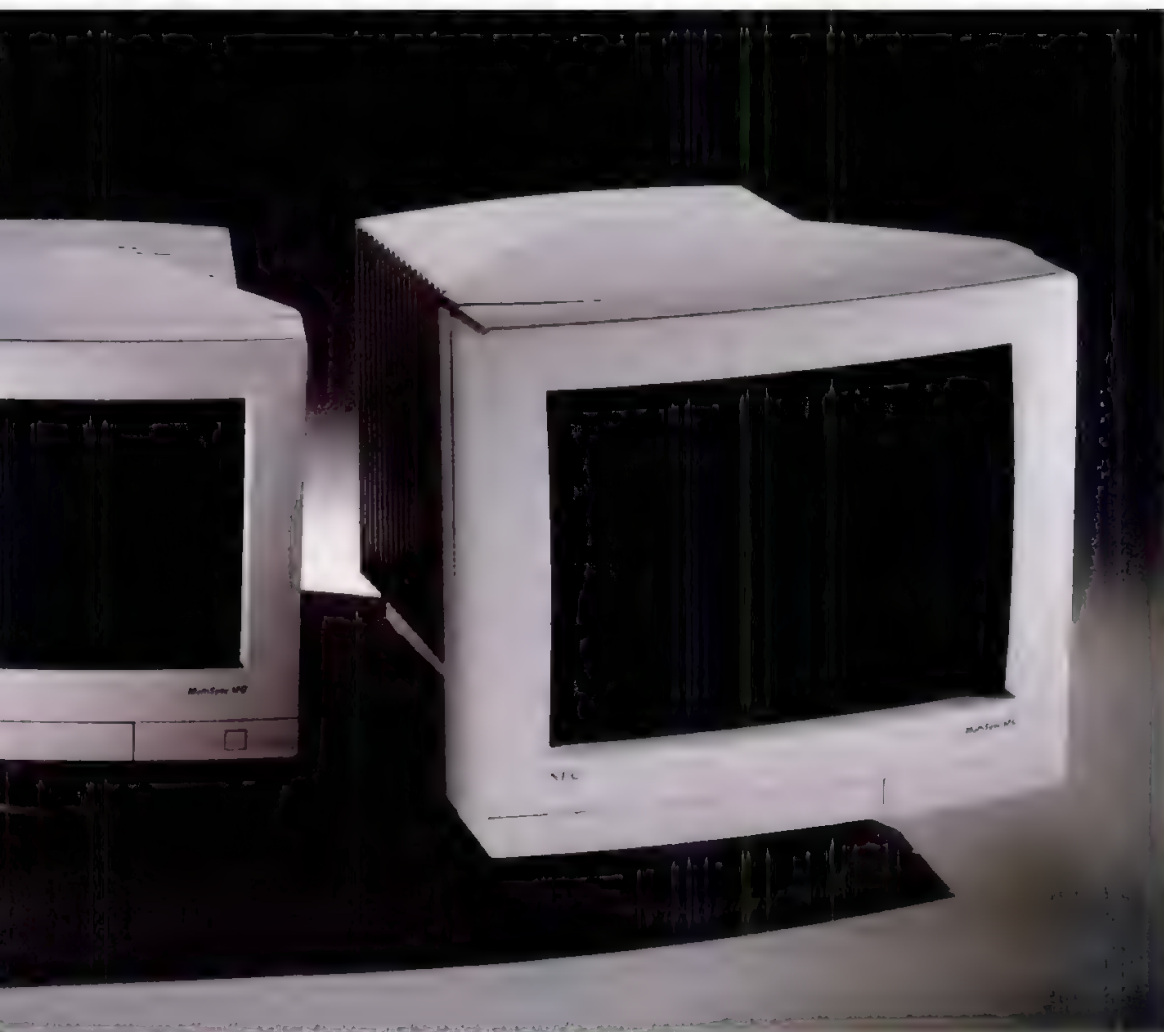
Announcing the new FG™ series of MultiSync monitors. Completely redesigned from the inside out to give you brighter, sharper, more accurate images. Now the monitor you've always wanted has all the features you ever wanted.

Features like our exclusive AccuColor™ Control System*. An amazing advance in computer monitors that provides unprecedented color accuracy. Now you can easily match on-screen colors to printer output, other monitors, process color standards such as Pantone® or even your personal preferences.

Advanced flat square screen technology takes the FG series performance into the future. Larger screens combined with our FullScan™ capability provide an edge-to-edge display with up to 36% greater active screen area** than most conventional

*Not available on the 390. © 1991 NEC Technologies, Inc. MultiSync is a registered trademark and FG, AccuColor, FullScan and EdgeDesign are trademarks of NEC Technologies, Inc. Pantone is a registered trademark of Pantone, Inc. Apple is a registered trademark of Apple Computer, Inc.**Dependent on graphics board and signal timing used.

everything?



Not an introduction. A revolution.

monitors. Higher refresh rates enable stable, flicker-free images. While the high-contrast screens eliminate blurring, display colors more vibrantly and deliver exceptionally sharp text and crisp graphics.

ErgoDesign™ elements enhance comfort and safety. An antistatic screen coating eliminates dust attraction. And all the controls are in the front where they're easier to use. Plus, our Reduced Magnetic Field™ technology lowers ELF and VLF emissions. In fact, they even meet the strict Swedish MPR II guidelines.

MultiSync monitors support a range of video standards from VGA to 1280 x 1024 non-interlaced, Apple Mac II and many workstation modes.

The all new FG series from NEC. For an image as clear as the one in your mind.

Because  is the way you want to go.

CIRCLE 217 ON READER SERVICE CARD

NEC

Make the

Smart Move

to a company with 11 years in the PC industry. CMO.

386SX Power Package for under \$2,200!



Be up and running in no time with this all inclusive package from CMO. The Power Package is ideal for a variety of applications – from accounting to word processing. This easy to use system comes with DOS 4.01 and Windows® 3.0 already installed! The **CMO Model 320** features 2MB of RAM (expandable to 5MB), an 80MB IDE hard drive, one 5.25" and one 3.5" high-density floppy drive, as well as a **CMO 14" Monitor** (with 640 x 480 resolution and .28mm dot pitch) and a 16-bit VGA adapter card. The **Epson LQ-510 Printer** rounds out the package with 24-pin letter quality and all necessary cables.

Included **FREE**:

- Prodigy Starter Kit with 2400 Baud Modem
- 3-button Serial Mouse
- Mousepad
- Curtis Surge Protector
- Curtis Disk Holder
- One Year TRW On-Site Service
- 10 Fuji 5.25" Disks
- Pack of Paper (250/pk.)

**Yours for
\$2,145**

CMO 386/33

- 33/10MHz 80386CPU
- 4MB RAM, expands to 8MB
- 64K Cache, expands to 256K
- 89MB HDD
- 1024 x 768 .28mm SuperVGA 14" monitor
- 16-bit 1MB video adapter
- Expansion slots: One 8-bit, Six 16-bit One 32-bit
- 5.25" 1.2MB or 3.5" 1.44MB FDD
- Expansion slots: One 8-bit, six 16-bit, one 32-bit
- Floppy hard drive controller
- Parallel/serial game ports
- 101-key AT-style keyboard
- Five 5.25" storage bays
- 220 Watt power supply
- Tower case

Check it out at \$1,899

CMO 386/25

- 25/12.5MHz 80386CPU
- 4MB RAM, expands to 8MB
- 89MB HDD
- 1024 x 768 .28mm SuperVGA 14" monitor
- 16-bit 1MB video adapter
- Expansion slots: Two 8-bit, five 16-bit, one 32-bit
- 5.25" 1.2MB or 3.5" 1.44MB FDD
- Floppy hard drive controller
- Parallel/serial game ports
- 101-key AT-style keyboard
- Five 5.25" storage bays
- 220 Watt power supply
- Desktop case

A smart move at \$1,699

CMO 40MB 20MHz 386SX Notebook with 2MB RAM

- 20/6.67/5MHz 80386SX-20CPU
- 2MB RAM, expands to 6MB
- 40MB HDD
- 640 x 480 LCD backlit display with 32 gray shades
- Built-in 3.5" 1.44MB FDD
- Intelligent Power Management Utilities
- Weighs only 6.38 lbs!
- Included FREE:**
- MS-DOS 4.01 software
- GW-BASIC software
- SafeLink anti-viral scanning software
- Deluxe, padded leatherette dual carrying case
- One year warranty
- 30-day money back guarantee

Winning price \$1,895

Special - 20MB Version NOW ONLY \$1,595

• Call for Latest Pricing •

CMO 1MB VGA Video Adapter 32,768 Colors AC0732 \$169	COLORADO Jumbo 120MB Internal Tape Back-Up CIDJ10 \$269	CMO Modem 2400 bps Internal AC0241 \$65
CMO VGA Monitor 14" Color ACMON7C4B \$239	PANASONIC Dot Matrix 9-Pin Printer PAKXP1180 \$159	SEAGATE 1102A 89.1MB IDE Hard Drive ST1102A \$289
PACIFIC DATA Pacific 4 2MB Memory Board PDMB260 \$319	CYRIX 80387-25 Coprocessor CXD25 \$195	FORA 9600 bps Send/Receive Pocket Modem FOP9624P \$199
OKIDATA 300 dpi Laser Printer OL400 \$639	WORD PERFECT 5.1 WP01 \$259	CMO Monitor 1024 x 768 14" SuperVGA ACMON7C8B \$395

We carry a large inventory of name brand systems, peripherals, accessories, software and networking components.



1-800-233-8950

In PA: 717-327-9200

FAX: 717-327-1217

Call today for a FREE color catalog!

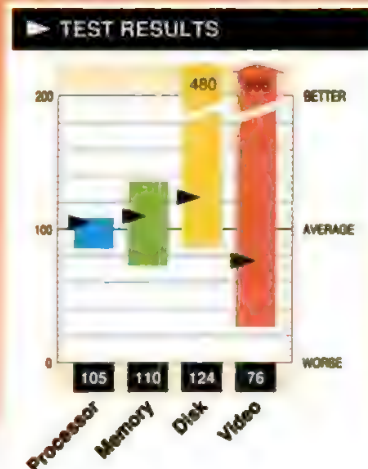


CMO is a registered trademark of Computer Mail Order. Source Code: PC17

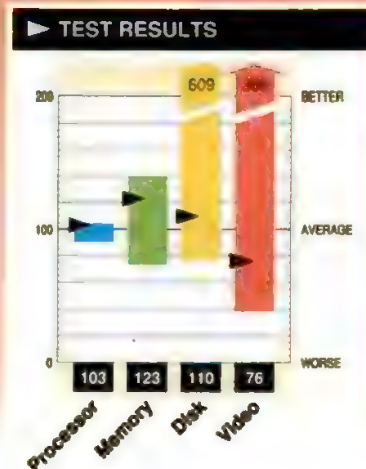
CIRCLE 516 ON READER SERVICE CARD

AST Premium II

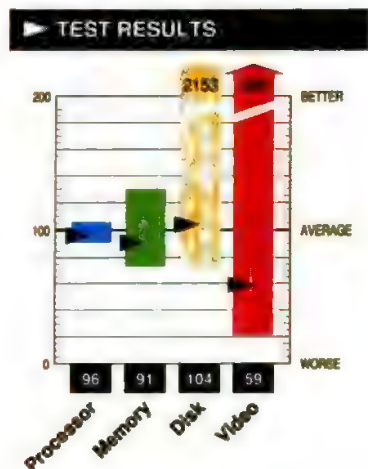
Processor: 386SX/20



Processor: 386/33



Processor: 486/33



In Short: Pull one FASTboard processor card out of an AST CUPID slot; put a new one in. That's all there is to upgrading the Premium II. At the levels we tested (20-MHz 386SX, 33-MHz 386, and 33-MHz 486), these systems showed respectable processor, memory, and disk scores, though the built-in Western Digital video subsystem turned in some below-par times.

AVERAGE PERFORMERS

AST's proprietary 32-bit CUPID (Completely Universal Processor I/O Design) bus architecture is the basis of the Premium II's upgrade path, and the concept is simple: I/O and BIOS bus functions are separated from the processor and memory bus. The BIOS, I/O ports, and video display circuitry reside on the motherboard and run at the ISA bus's 8-MHz speed. Processor, RAM, caching, and math coprocessing, found on the FASTboard, are handled by CUPID architecture and run at the processor's speed.

The three FASTboards tested by PC Magazine Labs were average performers compared with the other systems tested

here, as well as with those systems tested during the past year.

The 33-MHz 386-based FASTboard turned in the most competitive scores among its peers. In fact, it matches the performance of a nonupgradable AST Bravo 486-25 we tested for comparison. Similarly, the sub-15-millisecond Western Digital Piranha hard disk turned in consistently strong access times across all processor boards tested. The weakest component in the Premium II is the motherboard-based Paradise Super VGA display system. As with other systems, upgrading the processor had no effect on the video performance; the system turned in consistently below-average video test scores.

EASY INSTALLATION

Migrating from one FASTboard to another is a no-brainer: Just pull the old board out of the CUPID slot and plug in a new one. The AST system detects the newly installed FASTboard and its processor's speed without requiring you to rerun the setup program. The AST BIOS will similarly sense a new IDE hard disk.

The Premium II's small-footprint chassis leaves plenty of room for mass-storage upgrades, either on the extra half-height drive side mount or through the front drive bays, which can hold one full-height or two half-height drives in addition to the third-height floppy disk drive that is standard with the system. In addition, the Premium II line includes an option for a 40MB internal tape drive.

Even when loaded with the maximum 80MB of memory, the system board, which features six slots (including the three CUPID-capable ones), has one 8-bit and two 16-bit slots available for full non-CUPID expansion boards. If you don't need the extra memory, you have two extra 16-bit slots available. This is good news, since AST is largely positioning the various versions of Premium II as platforms for high-end graphics applications. This also means more than ample expansion room, since the video, ports, and IDE drive circuitry reside on the motherboard.

EXPANDED SERVICE

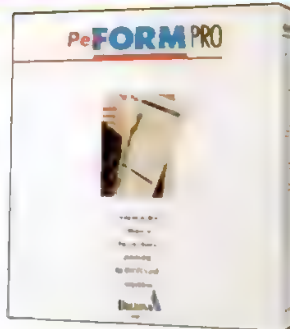
AST prices its Premium II Model 83B, with a 20-MHz 386SX FASTboard, 4MB RAM, a 16K processor RAM cache, an 80MB hard disk, a 1.44MB floppy disk drive, a Super VGA display system, one parallel and two serial ports, and DOS

ISA-compatible motherboard slots with extended bus connectors for AST's proprietary 32-bit CUPID architecture, the FASTboard line includes boards with 20-MHz 386SX, 33-MHz 386DX, and 33-MHz 486DX microprocessors. AST also produces a 20-MHz 486SX processor board, which lists for \$1,595 with 4MB RAM, that we did not review.

With room for up to 16MB RAM on each processor board and two additional CUPID slots for added memory boards holding 32MB each, the AST Premium II may be loaded with up to 80MB of 70-nanosecond SIMM RAM. And AST offers a selection of four IDE hard disks ranging from 40MB to 210MB.

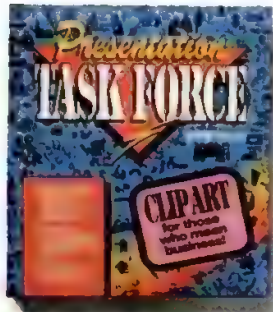
★ PerFORM PRO

(Delrina) Delrina puts the power and versatility of Windows 3.0 behind its newest selection of advanced design tools with PerFORM PRO. Meet your "high-end" form design and data management requirements with customized electronic business forms. Unique features include form folders, electronic signature security. If... Then statements and entry validation, in addition to enhanced graphics image importing and full color support. **BS2604 \$149.**



★ Presentation Task Force

(New Vision Technologies) Clip art for those who mean business. Presentation Task Force contains 1,100 vector graphics in the popular CGM format, making it compatible with most PC charting, drawing and word processing programs. The collection has been designed for business, health care and military professionals, and is suitable for all types of color and black and white printers. **GR0823/5 \$134.**



★ Winvoice

(Infinity Software) Make the best decisions for your company with Winvoice, an exciting graphical approach to the task of time and billing. Designed specifically for Windows, service-oriented businesses can efficiently log time and expenses, review work-in-progress, create and print customized invoices and statements with selectable fonts, and track receivables. **BS5364 \$165.**



★ OnTime for Windows

(Campbell Services, Inc.) OnTime for Windows is an easy to use, lifetime calendar and to-do list manager that takes full advantage of the Windows 3.0 environment. Features include: attractive calendar printouts including a tri-fold, week and month-at-a-glance graphic displays, automatic protection of recurrent records, to-do items that roll over until you mark them done and more. **BS3584 \$75.**



★ CorelDRAW! 2.0

(Corel Systems) CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power and over 150 fonts; over 3,500 clip art images and symbols; 31 import/export filters; an autotrace utility, a font conversion program and Mosaic, a visual file manager. **GR0543/5 \$399.**



★ PFS: Window Works

(Spinnaker) PFS: Window Works gives your small business everything it needs by combining a word processor, spreadsheet, database manager, graphics generator, terminal software, label maker, and address book. Built in hot links lets you share data among all the applications. Create memos, reports, newsletters, spreadsheet models, and customized database applications. **BS3604 \$125**



★ Publisher's Powerpak for Windows

(Atech Software) Fantastic Fonts and Outstanding Print Quality! PC World's Best Buy, Publisher's Powerpak provides true WYSIWYG for all Windows applications. Powerpak's on-the-fly fonts are scalable from 4pt. to 500 pt. Supports over 400 dot-matrix, inkjet and laser printers. Other versions for WordPerfect, Microsoft WordWorks, Ventura Publisher, and First Publisher. Receive 84 add-on typefaces free with Super Font Pack (150.00 value). **GR2763/5 \$55.**



MicroWarehouse
**YOUR
WINDOWS
SOURCE!**

Item numbers ending in 3 and 5 denote products available in 3 1/2" and 5 1/4" formats, respectively. Item numbers ending in 4 denote that both formats are included. Please refer to item numbers when ordering.

★ Windows-Compatible products

COMPUTERS & MEMORY

Leading Edge	
BN0090	D3/SX 386-16 Super V6A 1595
CP0100	N3/SX Notebook 40MB 2395.
Sharp	
CP0080	Wizard OZ 8200 399.
Memory	
	SIPPS, SIMMS, DRAMS Call.

EXPANSION & UPGRADES

All Computer	
EX0870	All Charge Card with Adaptors 299.
Brown-Wagh	
EX1510	MIDI Connector for SoundBlaster .. 59.
EN0910	SoundBlaster 149.
Cardinal	
EX1560	VGA 732 179.
Digital Vision	
EX1195	Computer Eyes Prof. Series 359.
Hayes	
EX1470	EtherMate Trio16 255.
InfoChip Systems	
EX1640	Expanz Plus Expander Card 99.
Intel	
EX1110	Co-Processor 80387SX 125.
EX0180	Co-Processor 80387-20 209.
Media Vision	
EX1580	ProAudio Spectrum 259.
Stac Electronics	
EX1480	Stacker 99.
EX1490	Stacker Co-Processor 165.

MEDIA & ACCESSORIES

Curtis	
AC2920	Command Center 85
AC2330	Computer Tool Kit (52 pc) 55.
Disks (boxes of 10)	
	BASF, Sony, Maxell Call.
Kensington	
AC3740	Laser Stand 52
AC0140	Masterpiece Plus 99
Power Backups	
VE0050	Getting To Know Windows Video ... 19.

Targus	
AC2340	Premier Leather Case 169.
AC0570/80	Leather Laptop Case 135.
AC0670	Universal Notebook Case 66.

DRIVES/CD ROM

HyperGlot	
CD0210	Learn To Speak Spanish 65.
Iomega	
DR0600	5.25" 44Mb Storage Cartridge 89.
DR0560	Bernoulli Box II 44Mb Int. 825.
DR1180	Bernoulli Transportable 919.
MicroSolutions	
DR1790	backpack 2.8Mb 299.
Optical Access International	
CD0180	CM 50 Portable CD-ROM 399.
BN0040	CM 50 Port. CD-ROM/CorelDRAW. 799.
Plus Development	
DR1890	HardCard II XL 50 399.
DR1880	HardCard II XL 105 MB 589.

PRINTERS & CARTRIDGES

Adobe	
BN0080	Adobe PostScript Cartridge with Type Cartridge 1 299.

BN0070	Adobe PostScript Cartridge with Type Cartridge 2 299.
PR1314	★ ATM Plus Pack 125.
AEG Olympia	
PR1750	NP80-24E Printer 315.
Canon	
PR1710	Auto Sheet Feeder for BJ-10e 72.
PR1500/10	Bubble Jet BJ-10ex 329.
PR0460	LBP8 Plus Mark III 1579.
PR0640	LBP4 Plus Laser Printer 2.0 999.
Citizen	
PR0680	GSX-140 Color Printer Font Cart. 329.
Elite Business Apps	
PR1270	Charisma 25/Plus 299.
Insight Development	
UT1714	PrintTools 89.
PR1614	Print-A-Plot 2.0 185.
IQ Engineering	
PR0610	Super Cartridge 2 335.
PR1950	Super Cartridge 3 Pro 299.
Metro Software	
PR1304	PC Accufax 69.
Pacific Data Products	
PR1120	25 Cartridges in One! 269.
PR0910	Pacific 4 Memory w/ 2Mb 145.
PR0920	Pacific Page Personal Edition 4.1. 369.
PR1990	PacificPage XL 799.
Panasonic	
PR1000	KX-P1124i Printer 299.
Seiko Instruments	
PR0690	Smart Label Printer 175.

MODEMS & FAX BOARDS

Cardinal	
MM0510	★ 4800 SendFAX/2400 Mod. Int. .. 75.
MM0770	9600 SendFAX Modem Int. 79.
Hayes	
FX0020	JT Fax 9600B Int. 379.
MM0250	Personal Modem 2400 Plus Ext. .. 149.
MM0810	Pocket Edition 2400 125.
CM0294	Smart Com Executive 75.
MM0210	Ultra SmartModem 9600 V.32. 689.
MM0860	Ultra 144 Call.
Intel	
FX1010	Satisfaxion Classic PC/XT 399.
PowerUser	
MM0630	Sendfax 24/48 68.
MM0640	Sendfax 24/96 85.
MM0680	Send/Receive fax 24/96 183.
MM0650	2400 Mini Ext. 85.
MM0670	2400 B Plus Int. 149.

CHECK OUT OUR PRICES!

OVERNIGHT DELIVERY
Only \$7.00

Practical Peripherals

MM0390	9600SA Ext.	479
MM0160	PM2400SA Ext. w/ MNP Lvl.5	209.

Prometheus

MM0610	ProModem 24/96BSR	218.
MM0700	ProModem 9600 Plus	599.
MM0790	ProModem Ultima	750.

The Complete PC

FX0060	The Complete Communicator	295.
FX0040	The Complete Fax/9600	239.

Zoom Telephonics

MM0690	HC2400S w/9600 Sendfax Int.	95.
MM0660	MX2400S w/9600 Sendfax Ext.	119.
MM0600	Modem V 42bis 2400 Ext.	155.
MM0820	V.32 Turbo	499.

NETWORKING

3-Com	Ethernet 11-Single User	215.
Artisoft	LanTastic 2 MBPS Adapter Card	149.
NT0110	LanTastic Ethernet Starter Kit	498.
NT0145	LanTastic Ethernet Adapter Card	225.
CC: Mail, Inc.	★ CC: Mail for Windows 1.0	335.
Intel	Lansight 2.0	287.
NT0204	Intel Netport Print Server	499.
Silka	Flashcard	149.
BS1973/5	DOSTOPS Network Bundle	155.
Xircon	Pocket LAN Adapter Ethernet BNC	395.

INPUT DEVICES

Appoint	Mouse Pen Professional	65.
IN2130		
Caere	★ The Typist (AT)	389.
IN0984R	★ The Typist (PS/2)	389.
IN0994R		
Calcomp	WIZ	149.
IN0640		
CH Products	FlightStick with Falcon 2.0	49.
IN0910		
Fifth Generation	Logical Connection Plus	469.
IN0900		
Kensington	Expert Mouse (bus/ser)	115/109.
IN0860/50		
Kraft	Toptrak w/ Foot Pedal	72.
IN1080		
Logitech	Scanman 256	299.
IN1070	Trackman Portable	99.
IN2250		
Marsatek	M-800 Scanner w/OCR	205.
IN1040	M-105 Plus Scanner w/OCR	149.
IN1020	★ M-800W Scanner w/Image-in	199.
IN2000	M-6000CG ColorArtist w/ OCR	499.
IN2070		
Microsoft	Ballpoint Mouse	119.
IN2150	Mouse (bus/ser)	85.
IN0890/80	★ Mouse w/Windows (bus/ser)	145.
IN0275/84		
MicroTouch Systems	The UnMouse	165.
IN0810		

★Correct Grammar for Windows

(WordStar) Correct Grammar for Windows checks grammar, spelling, style and the readability index for any Windows document, regardless of the application. When it finds a mistake, it even suggests a correction. Correct Grammar uses a combination of Dynamic Data Exchange and system hooks to the Windows clipboard to check text in any application. Requires Windows 3.0 **WP1604 \$59.**



★Intermission 2.0

(Icon Simulations) This window screen saver and password protection system saves your monitor by automatically displaying one of thirty animated screen saver modules. Protects your confidential work with password protection so only you can return to your screen and even protects your system from a reboot. Includes Curtain Call-the windows wallpaper changer. **GR1854 \$32.**



Shipping - Your choice:

Fast, dependable, overnight service - \$7 up to 7 lbs. Orders for in-stock items placed by 7:00pm ship same day. Ground service available - \$3 (same day shipping).

Nisa

IN1010	★ Niscan/GS for Windows	235.
--------	-------------------------	------

The Complete PC

IN2110	Complete Page Scanner w/ WordScan OCR Software	510.
--------	--	------

Z-NIX

IN1013/15	★ SuperMouse II (bus) w/Win 3.0	91.
IN1003/5	★ SuperMouse II (ser) w/Win 3.0	91.
IN1023/5	★ SuperMouse II (PS/2) w/Win 3.0	91.

MONITORS

NEC	Multisync 2A	545.
MT0020	Multisync 3D	699.
MT0070	Multisync GS2A	229.
MT0060		
Seiko	CM-1450 14" Color	699.
MT0270	CM-1440 14" Color	569.
MT0260		
Sony	14" Multiscan CPD-1304	675.
MT0240		

ENTERTAINMENT & EDUCATION

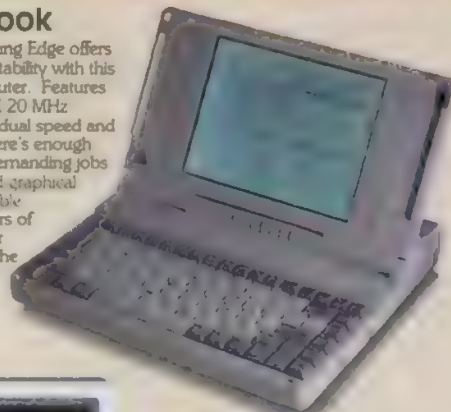
Artworx	Bridge 6.0	27.
EN2113/5		
Centron	Casino Master	41.
EN1073/5		
Entertainment On Line	Lottery Tracker & Wheeler 4.0	29.
EN2014		
Masque Publishing	Blackjack	39.
EN1384		
MECC	Word/Number Munchers	ea.29
ED0514/04		
Microsoft	★ Entertainment Pack	27.
EN1473/5	★ Flight Simulator 4.0	45.
EN0043/5		
PC Globe Inc.	PC Globe 4.0	35.
BS1834	PC USA 2.0	35.
BS1844		

DESKTOP PUBLISHING & GRAPHICS

Adobe	Adobe Fonts (various)	Call
PR1594	★ Adobe Type Manager	59.
GR2754	★ Adobe TypeSets	95.
GR2094	★ TypeAlign	59
Aldus	★ PageMaker 4.0	489/535
GR2053/5/4	Persuasion	339.
GR2174		
Application Techniques, Inc.	★ PictureEze 1.0	99.
GR2134	★ Pizzazz Plus 2.0	65.
BS0204		
ArtRight	★ Image Portfolio (various)	85.

N3/SX Notebook

(Leading Edge) The Leading Edge offers you convenience and portability with this compact notebook computer. Features include a powerful 386SX 20 MHz microprocessor, 16 MHz dual speed and a 40MB hard drive, so there's enough memory for your most demanding jobs including spreadsheet and graphical applications. A rechargeable battery gives you 2.5 hours of computing time. Whether you run the office or on the go, the N3/SX Notebook meets all your needs. **CP0100 \$2395.**



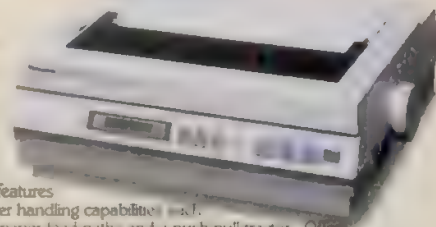
Leading Edge Model D3/SX

(Leading Edge) Combined power of 32 bit processor and the economy of 16 bit ISA peripherals gives you all current software and future 32 bit software. Features include both 3.5" and 5.25" drives, either 1 MB or 2 MB main memory expandable to 4 MB on the Motherboard, with a maximum system configuration of 16 MB. Includes support for an 80387SX co-processor, standard video memory analog and TTL outputs, a parallel and a mouse port. Also includes MS DOS, MS Windows 3.0 Basic and the Leading Edge mouse. 20 month warranty. **BN0090 \$1595.**



KX-P1124i

(Panasonic) Announcing the Panasonic KX-P1124i printer, a high speed 24-pin printer with the high end printer features you need. Control all of your printing features, save and recall them for up to four different applications using the EZ Set operator panel. Other features include: a wide variety of paper handling capabilities such as rear, bottom, front and top paper feed paths and a push/pull tractor. Offers excellent print quality with 11 resident fonts, ten different sizes and 360 x 360 dpi resolution. Includes a two year limited parts and labor warranty. **PR2200 \$299.**



FREE CATALOG!

We carry more than 1200 PC solutions including all the latest releases and updated versions. Just fill in the information requested below and we'll start your free, one-year subscription to the MicroWAREHOUSE catalog.

I'm Kerry, call me at:

WAREHOUSE

1-800-367-7080

(1-800-DOS-7080)

Inquiries: 908-370-0518 Fax#: 908-905-5245
Order Toll-Free 24 Hours a Day, 7 Days a Week

Free Micro Warehouse Catalog Subscription

1690 Oak Street, P.O. Box 1590, Lakewood, N.J. 06701

Fill out and mail this coupon to receive a free, one-year subscription to the MicroWarehouse catalog.

Name	
Address	
Apt.	
City	State Zip

(Expect to receive your next issue within 4-6 weeks)

CIRCLE 225 ON READER SERVICE CARD

1PM102

MicroWAREHOUSE® CHECK OUT OUR PRICES!



Spinrite II 2.0

(Gibson) Spinrite II 2.0 identifies, diagnoses and repairs every form of data and low-level format damage on standard DOS hard disks. Eliminates common DOS errors and optimizes system's sector interleave to deliver optimum hard disk data transfer rates. Detects disk surface flaws, moves endangered data to safety and much more. **UT0874 \$59.**

Graftek

(Artworx) Graftek, a data analysis and graphing environment, plots data and functions, performs calculus, statistics, frequency analysis, transformation and curve fitting. Its extensive library of analytical tools is ideal for extracting maximum information from technical, business, experimental and scientific data. Requires a graphics card and a mouse. **BS4004 \$85.**

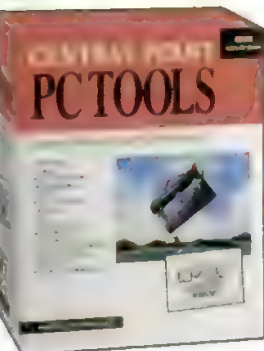
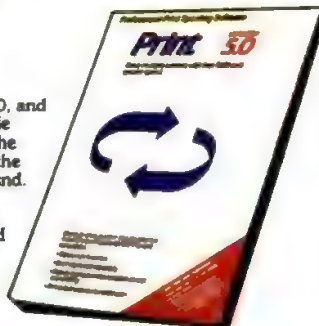


TurboTax for DOS Personal/1040

(ChipSoft) Turbo Tax is America's #1 software with over 6 million 1990 returns prepared. Features on-line help menus that explain IRS rules and point out possible audit-triggering situations. Includes over 80 IRS-approved forms, schedules and worksheets. There's a Turbo Tax state program available for every state with an income tax. Turbo Tax calculates even the most complex return in less than 10 seconds! **Now! Call.**

PrintQ 5.0

(Software Directions) Install PrintQ 5.0, and continue to work on other projects while your printer is working. PrintQ stores the print file on your hard disk and spools the data out to your printer in the background. Prints multiple copies, has a preview mode, is Windows 3.0 compatible and supports PostScript. Uses 1/2 RAM and is five times faster than 4.0. **UT1914 \$85.**



PC Tools Version 7.1

(Central Point Software) PC Tools Version 7 is an integrated utility that makes computing safer, simpler and faster. PC Tools gives you DOS programs for disk optimization and repair, file management, virus detection, remote computing, data security, system/network information, desktop management and more. Features both DOS and Windows applications for hard-disk backup and undelete. Now available, release 7.1. **UT2133 \$109.**

DesignCAD 3-D 3.1

(American Small Business Co.) DesignCAD 3-D will give your PC the power of a mainframe CAD system at a fraction of the price. Determine the volume, surface area, center of gravity and interference between objects. DesignCAD supports more than 400 peripheral devices and is compatible with an extensive array of graphics software and CAD systems, including AutoCAD. **CA0023/5 \$199.**



Unmouse

(MicroTouch Systems, Inc.) Use the most intuitive pointing device ever designed—your own finger. Introducing the Unmouse by Micro Touch. One million touch points and a touch sensitive glass tablet respond instantly to your touch. Unique templates allow you to execute function keys directly from the tablet. Also featuring truly outstanding graphics capabilities. **IN0810 \$165.**

Atech	GR2763/5	★ Pub. Powerpak for Windows	55.
	GR2773/5	Pub. Powerpak for WordPerfect	55.
Berkeley Systems	GR1994	★ After Dark	35.
Broderbund	GR1564	New Printshop	35.
	GR0064	New Printshop Companion	29.
Caere Corporation	GR1984	★ OmniPage 386 3.0	479.
Calera	GR2114	WordScan+	669.
Computer Associates Int'l	GR1823	★ CA Cricket Graph 1.3	85.
Corel Systems	GR0543/5	★ CorelDRAW! 2.0	369.
Custom Applications	GR1945	Freedom of Press Light 2.5	55.
hDC Computer Corp.	BS3114	★ Icon Designer	35.
Icom Simulations	GR1854	★ Intermision	32.
Micrografix	GR1773/5	★ Charisma	344.
	GR2783/5	★ Designer 3.1	485.
Microsoft	BS2304	★ Powerpoint for Windows	315.
New Visions Technology	GR0823/5	★ Presentation Task Force	134.
Power Up Software	GR0884	Express Publisher 2.0	99.
Software Publishing	GR2303/5	Harvard Graphics 3.0	415.
Timeworks	GR2334	Publish-It! 2.0	135.
Umage Corp.	GR2193/5	Perceive Personal 1.1	145.
	GR2183/5	★ Perceive	289.
WordPerfect	GR1194	DrawPerfect 1.1	269.
Xerox	GR1574	★ Ventura Pub. Gold 3.0 (Win.)	559.
ZSoft	GR0634	PC Paintbrush IV Plus	119.
	GR2024	★ Publisher's Paintbrush 2.0	299.

CAD PRODUCTS

American Small Business Co.	CA0023/5	Design CAD 3D 3.1	199.
	CA0203	Design CAD 5.0	249.
AutoDesk	CA0173/5	Autosketch 3.0	146.
Computer Easy	CA0153/5	Dream House Professional	47.
Foresight Resources	CA0124	★ Drafix CAD for Windows 3.0	435.
Generic Software	CA0074	Generic CADD 5.0	285.
IMI, Inc.	GR2384	TurboCAD Release 2	89.
MathSoft	CA0193/5	MathCAD 3.0	315.

BUSINESS

Abacus	UT1684	★ Becker Tools 2.0	76.
AddStor	UT2194	SuperStor	85.

Alpha Software	BS2164	Alpha Four	309.
Artworx	BS4094	Graftek	85.
Ashton Tate	BS0773/5	dBASE IV 1.1	485.
AutoMap, Inc.	BS5224	AutoMap	59.
Avery	GR0804	Label Pro Laser	45.
Borland International	BS0214	Paradox 3.5	505.
	BS3044	Quattro Pro 3.0	319.
Brown-Wagh	FN0424	★ Service Industry Accounting	295.
Buttonware	BS5134	PC File 6.0	85.
Campbell Services, Inc.	BS3584	★ OnTime for Windows	75.
Career Design Software	BS4034	Career Design	65.
Central Point Software	UT2064	Central Point Anti-Virus	79.
	UT2133	PC Tools 7.1	109.
Chipsoft		Turbo Tax for DOS Personal/1040	Call
Chronologic Corp.	UT0584	Instant Recall	62.
Computer Easy International, Inc.	UT2053/5	Command Performance	39.
Contact Software Int'l	BS1064	ACT! 2.0	215.
	BS3514	5-User Network Version	799.
	BS3504	Network Server Plus One	355.
DacEasy Inc.	FN0014	Dac Easy Accounting 4.1	85.
	FN0024	Dac Easy Bonus Pak 4.1	129.
Dariana Technology	UT1894	System Sleuth Analyzer	45.
	UT1904	System Sleuth Pro 4.0	95.
	UT1704	★ Win Sleuth 1.0	85.
Datastorm Tech.	CM0424	PROCOMM PLUS 2.01	65.
DCA/Crosstalk Communications	CM0284	Crosstalk Communicator	65.
	CM0194	★ Crosstalk for Windows 1.1	129.
Davidson & Associates	EN0024	Monologue	99.
Deirina Technology	BS0853/5	PerFORM Designer & Filler 2.1	95.
	BS2604	★ PerFORM PRO	149.
	FX0154	WinFax Pro 2.0	75.
Enable Software	BS1803/5	Enable BP	129.
FastTrax International	UT2024	FastTrax 4.0	49.
Fisher Idea Systems	BS3543/5	IdeaFisher 3.1	399.
	BS3574	Strategic Planning Plug-In Module	65.
Fifth Generation	UT0724	Direct Access 5.1	62.
Fox Software	BS0705	Foxtbase + Dev. System 2.10	189.
	BS4065	FoxPro 2.0	459.
Funk Software	BS3944	Sideways 3.3 w/ P.D. Queue	79.
GeoWorks	OP0064	GeoWorks Ensemble	125.
Gibson Research	UT0874	Spinrite II 2.0	59.
Great American Software	FN0264	Money Matters	51.
	FN0215	One-Write Plus Acct. System	170.
hDC Computer Corp.	UT1944	★ FileApps	75.

MICRO WAREHOUSE®
1690 Oak Street, P.O. Box 1590, Lakewood, N.J. 08701
©1991 Micro Warehouse Inc.

- Visa and Mastercard accepted
- Your credit card will not be charged until your order is shipped
- Purchase orders subject to credit approval
- All products covered by 120 day lid warranty *
- *Defective software replaced immediately
- Hardware replaced or repaired at our discretion
- CT residents add 8% sales tax N.J. and Ohio residents add appropriate sales tax
- Orders for in-stock items placed by 7:00 p.m.(E) weekdays (barring system failure, etc.) ship overnight by Airborne Express (Some areas require an extra day)
- Shipping charge \$7 per order up to 7 lbs. \$1 per lb. above 7 lbs.
- UPS ground service also available upon request - \$3 per order
- UPS orders placed by 3:00p.m. (E) weekdays, ship same day
- Actual freight charges apply for computers, hard disks, Bernoulli's, tape back ups, monitors and UPS printers.
- Alaska, Hawaii, outside continental U.S., APO/FPO call for information
- Item availability and price subject to change without notice
- Software is not copy protected, except where marked by asterisk
- We reserve the right to limit quantities
- * Please indicate disk size



IdeaFisher 3.1
(Fisher Idea Systems) Editors' Choice-PC Magazine. A powerful brainstorming system designed to assist planners, marketers, designers and product developers, writers and more. 7MB.
BS3543/5 \$399



AutoMap
(AutoMap Inc.) Before you head down the road, check with AutoMap, the colorful, computerized road atlas for PCs, with map displays and trip instructions. Just tell AutoMap where you're going and it will plan out your route for you. **BS5224 \$59.**



System Sleuth Pro 4.0
(Darlana Technology Group, Inc.) New systems analysis/hardware diagnostics include recognition of PC/XT/AT/PS2, testing facilities for chips, drives, video, keyboards, board installation and more. Determine system configuration and locate bad RAM. **UT1904 \$95.**



ProModem 9600 Plus
(Prometheus) High speed, low cost communications solution! 9600 bps data modem with V.42bis/MNP-5 data compression/error correction, 9600 bps send/receive fax, all the software and cable. **MM0700 \$599.**



TurboCAD Release 2

(IMSI, Inc.)

Now five times faster and yet incredibly easy to use, TurboCAD is a full featured drawing and drafting package with the power of software costing thousands. Features include pull-down menus, on-line tutorial help, complete macro language, integrated scientific calculator and easy symbol library creation. Works alone or with other specialized CAD systems. 250 symbols free with purchase. **GR2384 \$89.**

UT1634	★ FirstApps	55.
UT0644	★ Windows Express 3.0	55
Hellix		
BS3154	★ NetRoom Single User 2.0	49
BS2783/5	★ New Wave 3.0 for Windows	109
Infinity Software		
BS5364	★ Winvoice	165
Informix		
BS2283/5	★ Wingz for Windows and OS/2	325.
Insight Resource		
BS3423/5	Ko-Pilot for Lotus 1-2-3	59
BS3413/5	Ko-Pilot for WordPerfect 5.1	59
BS3433/5	Ko-Pilot for WordPerfect 5.0	59
Inner Media, Inc.		
UT1754	★ Wide Angle	65
Inset Systems		
UT1614	Hijaak 2.0	99.
Intuit		
FN0164	Quicken 4.0	37

BS2733/5	★ Productivity Pack	39
BS2704	★ Project for Windows 1.0	445
BS2253/5	★ Windows 3.0	90
BS1954	★ Windows Developer's Tool Kit	315
WP0043/5	Word 5.5	209
WP0374	★ Word for Windows 1.1	305
BS0173/5	Works 2.0	95
Microsoft/Helix		
BN0043/5	DOS 5.0/Netroom Bundle	99
Multisoft Corporation		
UT0554	PC-Kwik Power Pak 2.1	70
Niles & Associates		
BS3444	EndNote	95
Noio Press		
BS0124	Willmaker 4.0	36
Norton-Lambert		
CM0434	Close-Up LAN	550
CM0503/5	Close-Up 4.0 for Windows & DOS	119
Numbers & Co.		
UT125	Whiskers 3.01	19

Crosstalk Communicator/Crosstalk for Windows

(DCA/Crosstalk Communications) Crosstalk

Communicator lets you exchange data with other PCs, minis or mainframes, and access dial up services and bulletin boards.

Includes 13 terminal emulations, and 8 file transfer protocols. **CM0284 \$65.** Also available is Crosstalk for Windows, a full powered communications program designed specifically for windows with all the features you need, such as file transfer support, direct interaction with other Windows applications and much more. **CM0194 \$129.**



FN0434	QuickPay	30.
Jacoby & Meyers Law Offices		
BS2923/5	WillPower	32
Lotus		
BS3174	Agenda 2.0	288
GR0864	Ami Pro 1.2	299.
BS3403/5	Lotus 1-2-3 Rel. 2.3	339
BS2433/5	★ Lotus 1-2-3 Rel. 3.1	405.
BS3973	Lotus Graph Window II	335
BS2654	Lotus Works 1.0	95
BS2323/5	Symphony 2.2	515.
Magee		
UT0844	AutoMenu 4.7	38
mBAllen		
BS5164	The Daily Plan-It!	65
Meca		
FN0243/5	Managing Your Money 7.0	135
Merrill & Bryan Enterprises		
UT0994	InfoSpotter 2.5	49
UT2034	Remote Rx	69
UT1654	★ Turbo EMS 6.0	56
Metro Software		
UT0563/5	Laser Twin All in One	115
Metz Software		
UT1804	★ ThreadZ File F/X	75
Microcom		
CM0084	Carbon Copy Plus 6.0	115
UT0894	Virex PC	78
Micro Logic		
BS5124	InfoSelect 2.0	89
Microrim		
BS3493/5	Personal R-Base	99
Microsoft		
OP0113/5	DOS 5.0 Upgrade	59
BS3254	★ Excel for Windows 3.0	299
BS4103/5	★ Office for Windows 2.0	485

Okna Corporation		
BS3124	★ Desk Top Set	85.
Peachtree Software		
FN0233/5	Peachtree Complete III 5.0	145
FN0253/5	Peachtree Cmpl. III Bonus Bdle	215
Polaris		
BS2894	★ PackRat 4.0	259
BS2934	PackRat 3.0 Network Pack	429.
Precision Software		
BS1874	★ Superbase 4 Windows	410
Prisma Software		
UT1044	★ Your Way	129
Que Software		
WP0554	★ Legacy	298
QMS		
BS1624	★ Ultrascript PC Plus 2.1	279
Qualitas		
UT0683/5	386Max 5.1	75
UT1673	BlueMax	89
Quarterdeck Office System		
BS0163/5	DESQview 2.3	79.

Laser Twin All in One

(Metro Software) Laser Twin works as a printer emulator that fools your software into thinking it's printing to an HP Laserjet Series II printer. Print any font that is downloadable to an HP II Laser Printer (including Agfa Compugraphic and Bitstream fonts) in both portrait and landscape models. Features a built-in spooler for background printing. **UT0563/5 \$115.**

BS1043/5	DESQview 386 2.3	135.
EX1103/5	★ OEMM 386 5.1	61.
Que Software		
WP0544	RightWriter 4.0	55.
Reality Technologies		
FN0124	Wealthbuilder 1.1	139.
FN0334	WealthStarter 1.0	35.
Reference Software		
WP0334	Grammatik IV 2.0	55.
WP0514	★ Grammatik Windows	55.
Sea, Inc.		
UT2114	Arc+Plus 7.12	49.
SitBack Technologies		
BS3554	★ SitBack for Windows	79.
Softlogic Solutions		
UT0733/5	Disk Optim Tools w/ Data Guard. ..	35.
Software Directions		
UT1914	★ Print Q 5.0	85.
UT0884	PrintQ LAN	285.
Software Products International		
BS2864	★ Access SQL Multi User	949.
BS2873/5	Open Access III	425.
Software Publishing		
WP0463/5	Professional Write 2.2	160.
WP1523/5	★ Professional Write Plus	169.
Software Ventures Corp.		
CM0314	★ MicroPhone II for Windows	215.
Spinnaker Software		
BS1923/5	BetterWorking Eight-In-One	32.
BS3604	★ PFS:Window Works	125.
BS1134	The Resume Kit	29.

Symantec		
WP1573/5	★ Just Write 1.0	129
UT2154	Norton AntiVirus 1.5	85.
UT0054	Norton Util. Advanced 6.0	115.
UT2153	★ Norton Backup Windows/DOS ..	85
BS4013/5	Q&A 4.0	255.
BS3723/5	On Target 1.0	255
Teleware		
FN0414	★ M.Y.O.B.	135.
Timeslips Corp.		
BS0133/5	Timeslips III 4.0	189.
Touchstone		
UT0734	Check It! 3.0	85.
Traveling Software		
UT0394	Laplink III	89.
UT2014	★ WinConnect 1.0	65.
Vertisoft		
UT0904	Double Disk	62
WestCliff Software		
WP1504	DosAmigos	99.
WordPerfect Corp.		
WP0363/5	WordPerfect 5.1	249.
WP0504	LetterPerfect 1.0	129.
WordScience		
WP0483/5	Definitions Plus	65
WordStar U.S.A.		
WP1604	★ Correct Grammar for Windows ..	59
WP0634	WordStar Legacy	269.
XTree Company		
UT1874	XTree Gold 2.0	92.

LANGUAGES

Asymetrix		
LN1454	★ Toolbook	289.
Borland International		
LN1654	Borland C++ 2.0 Prof.	329.
LN1664	★ Object Vision for Windows ..	95.
Microsoft		
LN0074	C Compiler 6.0	315
LN0043/5	QuickC 2.5	65
LN1674	Visual Basic	129.
Nantucket		
LN1444	Clipper 5.1	510
Solution Systems		
LN0433/5	Bref 3.1 for DOS	179
Spinnaker Software		
LN1464	★ Spinnaker Plus	269





4.01, at \$3,395. The SX-based Model 83B comes bundled with *Microsoft Windows 3.0* and a mouse, though other configurations do not.

Our test system came with 8MB RAM, the 386SX FASTboard, and a 210MB hard disk for a total system price of \$3,985. The \$4,615, 33-MHz 386-based system came with 4MB RAM and a Weitek 3167 coprocessor socket. AST's system price for the Premium II in its tested configuration with a 33-MHz 486 FASTboard and 4MB of RAM is \$4,495. Many of the FASTboards are also completely compatible with the older Premium line—except where the BIOSes in the older systems are out of date for newer processors such as the 486SX. In that case, a new BIOS is included as part of the upgrade kit.

AST requires you to turn in an old processor card—either a 386SX or a 386DX—when you purchase a faster card. There is no specific buy-back policy, but according to AST, the price of the card includes the trade-in.

AST has expanded its service and support to include toll-free technical support, bulletin board service, and a customer fax line. AST offers a limited one-year warranty on parts and labor. You'll need to return your unit to any authorized dealer or AST-approved Intellogic Trace carry-in center. AST offers additional warranty and post warranty on-site and carry-in service programs through AST authorized service centers, Intellogic Trace customer support centers, and Texas Instruments maintenance centers that carry approved AST-compatible parts. Each Intellogic Trace on-site service call costs \$160, and AST's Premium Protection Plan fee, which extends the standard warranty



The AST Premium II's CUPID architecture separates memory from the I/O bus.

for up to two years, is adjusted according to the configuration (for example, \$240 covers a 486 with a 110MB hard disk for an extra year).

Although it may not be the fastest upgradable on the block, AST's Premium II's easy upgrade path, variety of options, and solid support make it an appealing solution for those who are looking for systems with growth potential.

COPAM INC. Copam B Series by Patrick Honan



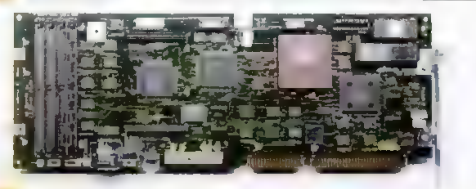
Copam's B Series takes the idea of upgradability as seriously as any of the upgradable PCs in our review group. Available with CPU boards equipped with 16-MHz 386SX, 25- and 33-MHz 386, and 25-MHz 486 processors, the B Series delivers the kind of across-the-board freedom originally promised by this class of machine. The complete interchangeability of Copam's CPU boards is one of the B Series' strongest features. You will always be able to select the right processor for your needs when it's time to upgrade.

Copam's B Series consists of the 386SX-B-16, 386B-25, 386B-33, and 486B-25, installed with 16-MHz 386SX, 25-MHz 386, 33-MHz 386, and 25-MHz 486 CPU boards, respectively. We tested all models except the 386B-25. Copam plans to introduce boards using Intel's 20-MHz 386SX and 50-MHz 486 processors and AMD's 40-MHz 386 processor by the fall.

ALL FOR ONE

Some manufacturers, like ALR and Dell, put only the processor and coprocessor on the CPU board and leave components such as RAM on the motherboard. Copam uses a different design that puts the processor and coprocessor, system BIOS, CMOS, and RAM on its CPU board. The only key system elements on the motherboard are the system's one parallel and two serial ports, the floppy/hard disk controllers, and the SVGA video circuitry. The system's expansion slots reside on a backplane board connected to the motherboard. The CPU board itself plugs into a proprietary slot on the backplane.

This approach makes Copam's CPU boards more expensive than processor-only boards. For example, Copam's 16-



Copam's B Series system upgrades from 386SX to 486 but doesn't have the fastest-rated chips in each category.

MHz 386SX CPU board costs \$525, but ALR's 16-MHz 386SX board, which bears only the 386SX chip, costs only \$395. The gap widens considerably between the Copam and ALR 25-MHz 486 CPU boards: \$2,679 versus \$1,995. All prices are suggested list prices, and since Copam sells through retailers, buyers can expect significant street discounts, according to Copam.

Copam's design makes for more expensive CPU boards but offers a couple of benefits in day-to-day use. For starters, the 386 and 486 systems have a 32-bit data path between processor and memory. On some systems that put memory on the motherboard, the path is only 16 bits wide. Granted, most DOS applications are still written for a 16-bit path, but that will change quickly over the next few years.

GATEBUSTERS!



\$3,599 | \$4,599
486-33 ISA* 486-33 EISA**

- 32-Bit Intel 80486/33 MHz CPU
- Burst Mode Support
- Zero-Wait 64KB (Exp. to 256KB) High Speed Cache*
- Zero-Wait 128KB High Speed Cache**
- 4MB Zero-Wait State 32-bit Memory on the World's Best Motherboard made by AMI (Expands to 32MB*/96MB**)
- 8 Expansion Slots: 16-bit* 7-EISA and 1-32/8 bit**
- Sony 1304 HG 14" SVGA Monitor (1024 x 768 Resolution, Non-interlaced)
- Orchid ProDesigner II VGA Card with 1MB RAM
- 207MB 15ms Maxtor IDE Hard Drive
- Teac 1.2 and 1.44 Floppy Drives
- 2 Serial/1 Parallel Ports I/O*
- 2 Serial/2 Parallel Ports I/O**
- PC Power & Cooling 300 Watt Power Supply
- Vertical Case: 6 Bays/Security Lock/LED (Also shown is our optional deluxe case 12 1/2 bays with 450 watt power supply)
- Keytronics 101-key Enhanced Keyboard
- AMI BIOS/CMOS Set-up/Diagnostics/Clock/Calendar
- 3-Ring Cloth Binder for Manual and Software
- 10-year Lithium Battery/TOUCHE Tool
- 800 number for Lifetime Technical Support
- TRW On-Site Service Available to Most Locations
- Federal Express Replacement of Defective Components
- FCC B Certification

\$2,999
386-33 MHz
COMPLETE SYSTEM

Upgradable to 486 with Plug In Board!

LEADING THE WAY!

State of the art technology is what you receive when you order a **TOUCHE** computer. The heart and soul of any computer is the motherboard. An AMI in a **TOUCHE** computer is quite simply the very best. We mean what we say and here are the facts!

FACT: Computer Shopper compared 3 systems in its July cover feature. **TOUCHE** beat **NORTHGATE** and **DELL** in the overall total speed test for performance! Shopper also said, "**TOUCHE**'s system operated quietest. . . **TOUCHE** obviously offers the fullest expansion of the three systems. . . **TOUCHE**'s ESDI edged out **NORTHGATE**'s IDE drive and **DELL**'s slower IDE." Of all three systems **TOUCHE** was the least expensive. Shopper also said, "In fit and finish **TOUCHE** offers among the best we've seen."

FACT: Our AMI partnership enabled us to begin shipping 386 to 486 upgradable systems in 1989. . . 2 years before **NORTHGATE** even announced theirs! Northgate President Art Lazere is quoted in PC WEEK 06/03/91, "Upgradable is the wave of the future. . ." Unfortunately anyone riding the **NORTHGATE** wave is sunk when it comes to upgrading their 386 systems. Now that everyone wants a 486 anyway, what good is that to customers that bought Northgate systems for the past 2 years? Only **GATEWAY** knows when their upgradable system will ever become available.

FACT: **TOUCHE** was first to offer a 386 caching motherboard because AMI was the first to design a caching 386 motherboard.

QUALITY

We take great pride in the fact that we include a 2-year replacement part warranty on every component. Gateway, Northgate, and Dell include only a 1-year warranty. After you buy a **TOUCHE** you'll never need to worry which component might fail after only 1-year of use! Even more importantly replacing failing parts can be extremely expensive. Investigate the cost of repairing your IDE or ESDI hard drive. There goes a whopping \$300-\$400! Maybe you'll get it back in working condition after 3 or 4 weeks. We won't even try to guess what happens when their motherboard fails! You simply can't afford to buy any system which offers you only a 1-year warranty!

The quality and craftsmanship that go into every **TOUCHE** computer is unmatched in this industry. All systems are diligently assembled in Darien, Illinois by our team of dedicated technicians. We guarantee that you will receive a custom-built configuration exactly as ordered using our uncompromising WYSIWYG standards. Be certain when you're shopping, that other companies provide you with a list of the manufacturer and model number of every component they plan (promise) to use in their system.

From the world-renowned AMI motherboard to the #1 rated PC Power Cooling switching power supply EVERY component we use is simply unbeatable.

MORE FACTS

GATEWAY? Ask them about their EISA systems. They don't even offer this very latest standard in computer technology. Did you know every customer who ordered a 386 computer from **TOUCHE** since early 1990, over 1 year ago, can easily upgrade to a 486 with our simple plug-in card for only \$999? Not a single **GATEWAY**, **NORTHGATE**, or **DELL** computer purchased in 1989, 1990 and most of 1991 can be upgraded from 386 to 486 like the tremendous number of customers who have already taken advantage of this state of the art option **TOUCHE** offers. We're sure they'll gladly take your order for a new 486 though. Give yourself a break and buy a **TOUCHE**!

Call **TOUCHE** and speak to one of our sales associates today!



Made in the USA

TOUCHE

A PCMIOS Company
 8205 South Case Avenue Darien, Illinois 60559
 708/810-1010 Fax 708/810-9490



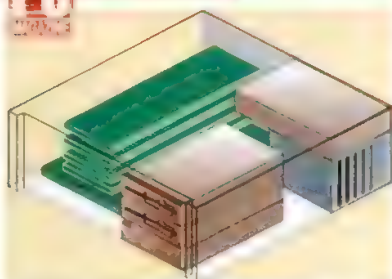
WHO YA GONNA CALL?

708/810-1010

CIRCLE 533 ON READER SERVICE CARD



FACT FILE



Copam B Series

Copam Inc., 45875 Northport Loop E,
Fremont, CA 94538; 415-623-8911.

Processor and system prices (tested configurations): 386SX/16, \$2,338; 386/33, \$3,055; 486/25, \$4,492.

Memory and processor RAM cache: 4MB 80-ns. SIMMs, 64K cache.

Disk drives and controller: Seagate 19-ms. 124MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Trident 512K 1,024-by-768 adapter, Copam 14-inch monitor.

Software: DOS 4.01.

Processor options: 386/25, \$1,190.

CIRCLE 609 ON READER SERVICE CARD

Copam's design allows you to take advantage of 32-bit software as it is published.

The unit we tested had 4MB of RAM, a 124MB IDE hard disk, two floppy disk drives, a Super VGA display subsystem, and DOS 4.01. That configuration costs \$2,338 with the 16-MHz 386SX CPU board, \$3,055 with the 33-MHz 386 CPU board, or \$4,492 with the 25-MHz 486 CPU board, with 8MB RAM on each CPU board. When you are ready to upgrade, your dealer will decide how much credit to allow for your old CPU board, but Copam claims that 50 percent is a typical rebate amount.

NO DEALERS FOR DINNER

Installing a CPU board in the Series B takes a little work, but it isn't so complicated that you will want to have your dealer over for dinner. Because each board contains its own BIOS, there is no need to change the BIOS chip, and there are no jumpers or DIP switches to set. You will need to unplug several wire leads from the CPU board to the speaker and reset button, remove any other boards on the backplane that might block access to the CPU board, slip the board out of the slot, insert the new board, and reconnect the wires. Each new CPU board requires you to configure its CMOS setup information to match the rest of your system's equipment.

BABY CASE, BABY EXPANSION

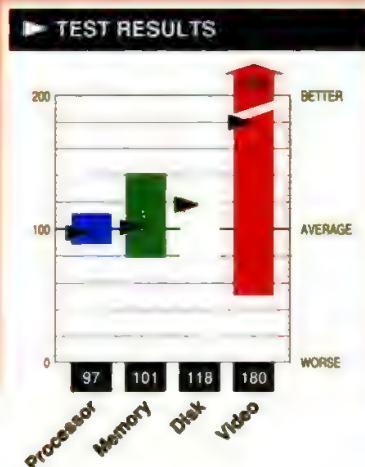
The B in B Series stands for baby-style case, and the unit's 6- by 14- by 15.25-inch size clearly lives up to this designation. Inside, the four 16-bit slots are open in the standard configuration. Adding RAM doesn't take up any of these slots, since RAM installs in SIMM sockets on the CPU boards. Each CPU board supports a maximum of 16MB of RAM. There are four half-height drive bays, three of which are accessible from the front panel. The fourth bay, which housed the hard disk in the reviewed machine, resides over the power supply on the right at the rear of the case. The hard disk is raised slightly above the power supply,

and Copam claims that a hard disk in this bay is in no danger of damage from vibrations or heat generated by the power supply.

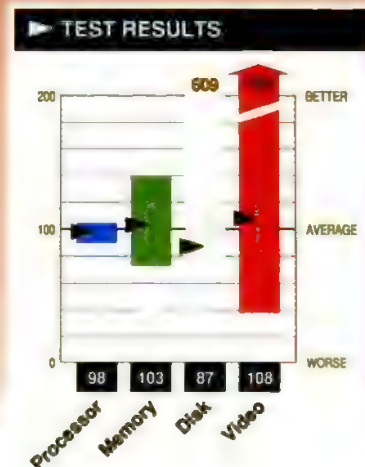
Although you can change the processor at any time, you're locked into the modest expansion capabilities of the B Series for as long as you own the machine. Slots and drive bays that seem ample today may not be two years from now. Think hard about what upgrades you are likely to make to the system beyond new processors and more RAM. Those four expansion slots will fill quickly if you add controller boards for a CD-ROM player or tape backup drive, a modem, fax board, or network adapter board. Copam is considering an upgradable system in a larger case but has no current plans.

Copam B Series

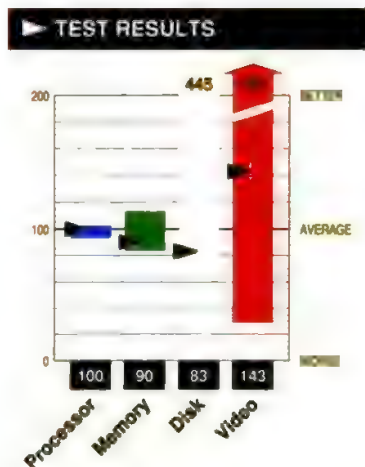
Processor: 386SX/16



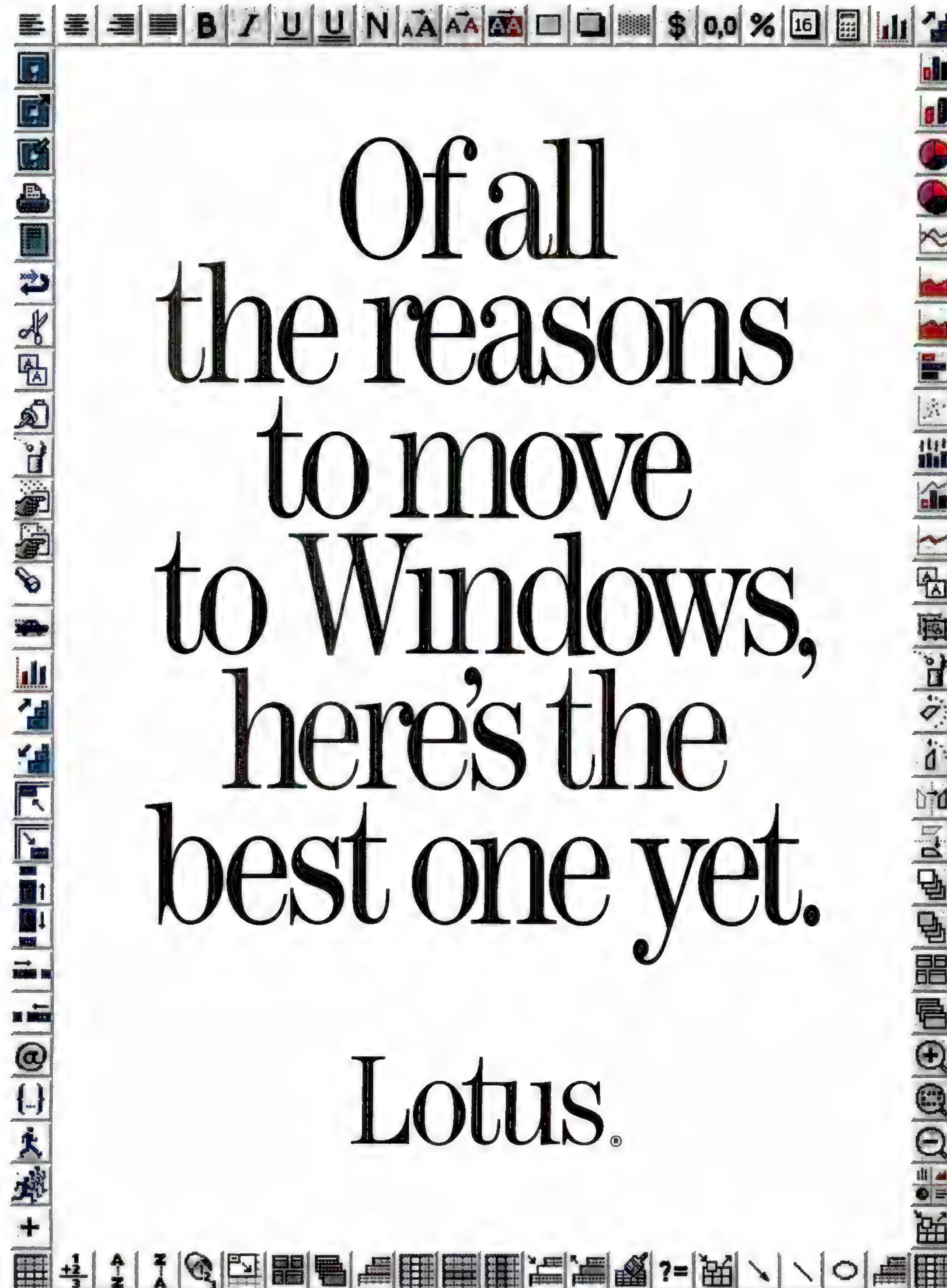
Processor: 386/33



Processor: 486/25



In Short: An average all-round performer, the Copam B Series offers a large yet somewhat limited assortment of processors at this point, since it lacks a 20-MHz 386SX and a 33-MHz 486. Also, this system's 386 processor ran at 33 MHz, compared with the 33.3 MHz typically encountered. The slightly lower speed, however, had little effect on test scores. The 486/25 configuration was clocked at 25.2 MHz.

The image is a screenshot of the Lotus 1-2-3 spreadsheet application. The central area is a white workspace containing the text "Of all the reasons to move to Windows, here's the best one yet." in a large, black, serif font. The workspace is framed by a grey border containing various icons. The top border includes icons for file operations (new, open, save, print), formatting (bold, italic, underline, text color, fill color, background pattern), and calculation (currency, percentage, number format, calculator, chart). The left border contains icons for navigation (home, previous, next, end), editing (undo, redo, delete, insert), and data manipulation (copy, paste, fill, sort, filter). The right border contains icons for charting (bar, line, pie, area, scatter), data analysis (pivot table, goal seek, solver), and other functions (help, about, settings). The bottom border contains icons for window management (new window, open window, save window, print window), calculation (sum, average, count, max, min, range), and other functions (help, about, settings).

Of all
the reasons
to move
to Windows,
here's the
best one yet.

Lotus®

It's everything a Windows spreadsheet was meant to be.

After listening carefully to what our customers were looking for in a Windows™ spreadsheet, we developed Lotus® 1-2-3® for Windows with three goals in mind.

First, make it a full-fledged Windows application.

Second, introduce innovations that deliver a perfect balance of power and simplicity.

And third, make it fully compatible with all of the earlier versions of 1-2-3 that millions of 1-2-3 users are familiar with.

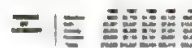
Well, we've done all this. And a whole lot more. Which, no doubt, is why 1-2-3 for Windows was awarded Byte Magazine's *Best New Windows Application* at Comdex/Spring '91.

For starters, the most exciting new part of 1-2-3 for Windows is its SmartIcons™, an innovative approach for automating common spreadsheet tasks.

These icons are "one-click" shortcuts for your most frequently used spreadsheet tasks. Such as summing up a row of numbers, setting text to bold, creating a graph from a range of data, retrieving, saving or printing a file, table formatting or charting, and more. These

These fully customizable SmartIcons give you push-button access to basic and advanced spreadsheet functionality. Just by pointing and clicking the mouse. Over 50 standard icons come with the program. Plus, you can create new icons to suit your needs. For example, sum a column or a row or change text to bold, all in a single step.

Double Take Productions



Double Take Productions

Category	Value
Project A	80
Project B	60
Project C	40

Category	Value
Change A	80
Change B	60
Change C	40



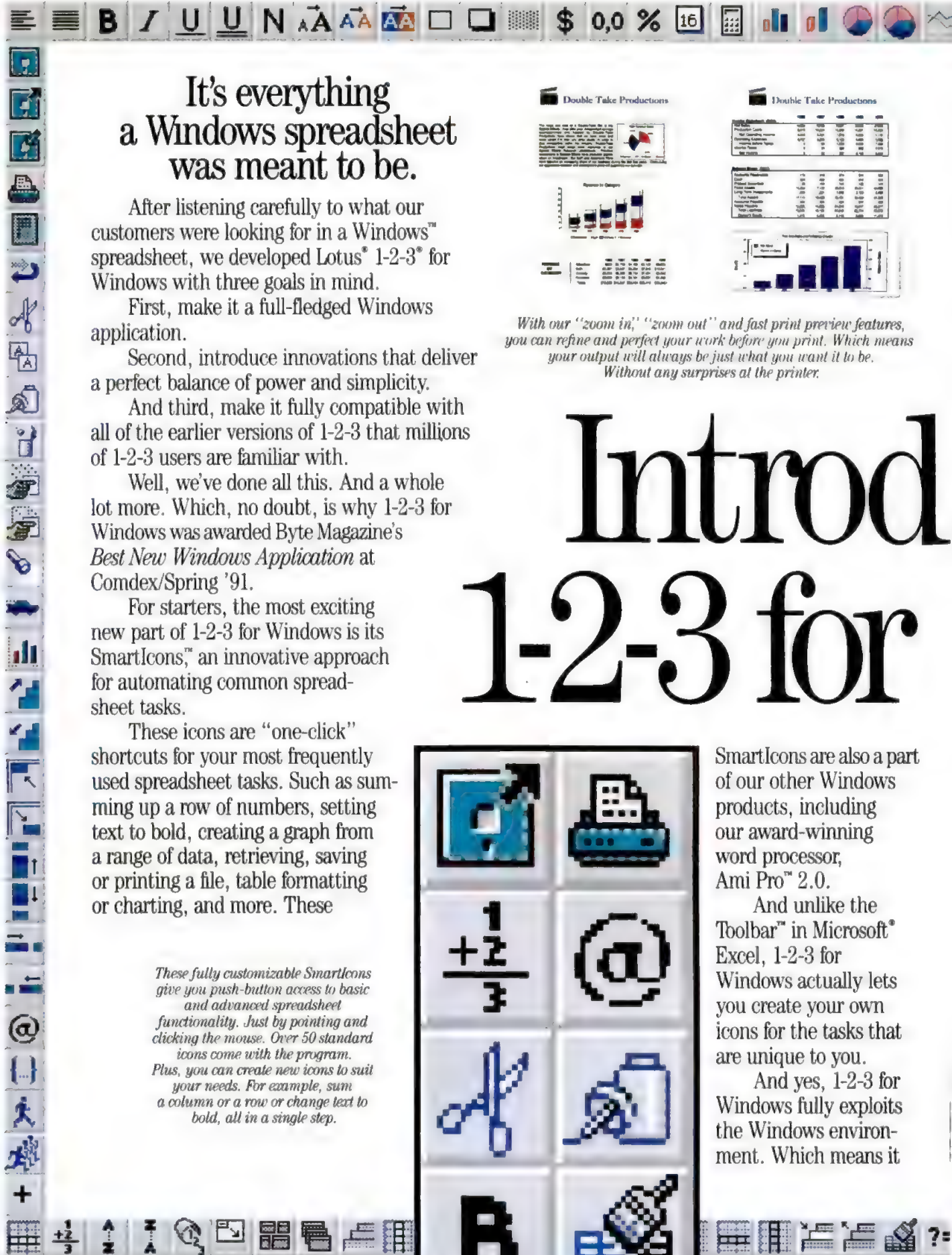
With our "zoom in," "zoom out" and fast print preview features, you can refine and perfect your work before you print. Which means your output will always be just what you want it to be. Without any surprises at the printer.

Introd 1-2-3 for

SmartIcons are also a part of our other Windows products, including our award-winning word processor, Ami Pro™ 2.0.

And unlike the Toolbar™ in Microsoft® Excel, 1-2-3 for Windows actually lets you create your own icons for the tasks that are unique to you.

And yes, 1-2-3 for Windows fully exploits the Windows environment. Which means it

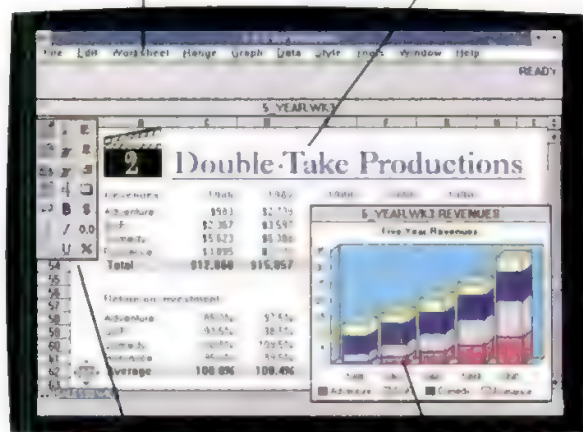


includes pull down menus, dialog boxes, sizable windows, mouse support, full DDE support, Context-Sensitive Windows Help and everything else you'd expect to find in a true Windows application.

What's more, with its interactive graph gallery, you can preview and select by example a wide range of graph types, including true 3D graphs in bar, line, area, stacked bar and pie. We've even added a new table chart graph type. Altogether, you can create over 200 different graph style combinations.

You'll feel right at home with our true Windows interface. And you can easily integrate your spreadsheet data with other Windows applications.

The program includes Adobe Type Manager® (ATM),® the leading scalable font manager, for outstanding spreadsheet publishing and presentation options.



Our palette of customizable SmartIcons can be sized and placed anywhere on your screen.

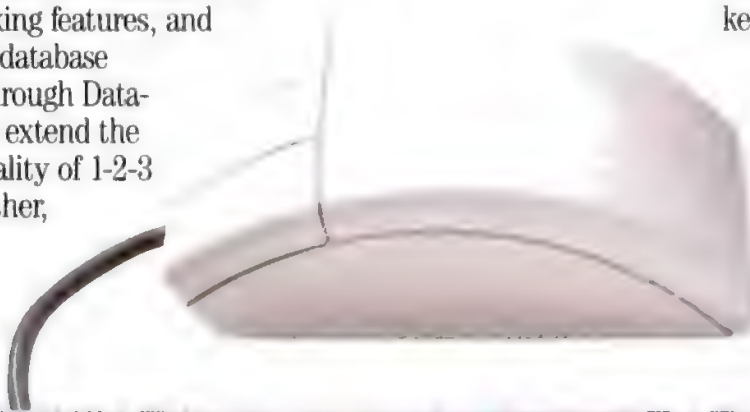
Our interactive graph gallery means you can preview and select by example a wide range of chart and graph types.

Using Windows.

Of course, when you're ready to print, your results will be nothing short of perfection. And thanks to its Auto Compress feature, you can easily make an entire report fit on one page.

Beneath it all, you'll have all the power of 1-2-3 at work for you. Including its innovative 3D worksheets, Solver and Backsolver goal-seeking features, and external database access through Data-Lens®. To extend the functionality of 1-2-3 even further,

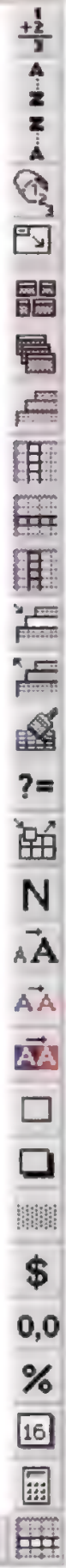
With all the added short-cuts you'll gain from SmartIcons, the mouse will be the one thing you'll want to hang on to.



developers can use our new 1-2-3 for Windows Add-In Development Kit to create an unlimited number of customized applications.

And finally, to make the move to Windows a simple one for 1-2-3 users, we've included the 1-2-3 Classic® commands in the program. Where, at the push of the slash key, the familiar 1-2-3 menu will appear, fully functional, on screen. So not only are all the files, styles and macros you've worked with compatible with 1-2-3 for Windows, but the keystrokes you've been using to create them are, too.

But for now, turn the page. And find out even more about why 1-2-3 for Windows is the spreadsheet that over 14 million people already know how to use. Without ever having tried it.

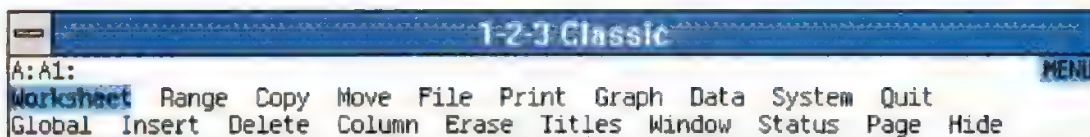


Pure Windows. Pure 1-2-3.

In other words, 1-2-3 for Windows is everything you've asked for. A true Windows program that offers complete compatibility with earlier versions of 1-2-3. Plus, it not only reads and writes all files from 1-2-3 for DOS and Lotus Symphony,* but also all style formats

previously released version of 1-2-3. So whether you're a current 1-2-3 user or a Windows user, you can jump right in and get to work.

All of which proves that while we were paying close attention to the little things, we weren't overlooking your bigger needs.



Push the slash key and you'll have instant access to the familiar 1-2-3 menu which will appear in a window on your screen.

from the Allways™ and Impress™ integrated spreadsheet publishing tools. It even reads files, styles and macros created in Microsoft® Excel.

Better still, with the 1-2-3 Classic menu, you won't need additional training. Because, as we've mentioned, the familiar 1-2-3 menu is always a key-stroke away. Which means you can then enter commands the way you would in any

So see why Lotus 1-2-3 for Windows is more than a great Windows spreadsheet. It's everything you've been looking for in one.

And now you can upgrade from your current version of 1-2-3 to 1-2-3 for Windows and get both 1-2-3 and Ami Pro 2.0 for just \$199.* A suggested retail value of \$645. For a free auto demo or to order your upgrade directly from Lotus,** call **1-800-TRADEUP, ext. 6046.**



1-2-3 for Windows



*Suggested retail price. Offer expires December 31, 1991.
© Copyright 1991 Lotus Development Corporation. All rights reserved. Lotus, 1-2-3, Symphony, and DataLens are registered trademarks and SmartIcons, Allways and Impress are trademarks of Lotus Development Corporation. Classic is a registered trademark licensed to Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, a wholly owned subsidiary of Lotus Development Corporation. Adobe Type Manager and ATM are registered trademarks of Adobe Systems, Incorporated. Microsoft is a registered trademark and Windows and Toolbar are trademarks of Microsoft Corporation. **Please have your credit card and product package ready when you call. In Canada, call 1 800-668-1509.

PERFORMANCE

The B Series delivers average performance. Its 33-MHz 386 CPU board comes standard with a 64K cache of 25-nanosecond SRAM. The same 64K cache is a \$119 option on the 25-MHz 386 CPU board. Copam does not offer a RAM cache for the 16-MHz 386SX CPU board, and the 25-MHz 486 CPU board contains only the 8K RAM cache built into the 486 processor. The 19-millisecond IDE hard disk fell into the slower half of the hard disks on PC Magazine Labs' DOS File Access test.

Unlike the hard disk, the Trident chip set with 512K of video RAM turned on one of the fastest screen access times on the benchmark test. Copam furnishes motherboard-based 15-pin and 9-pin Super VGA ports that support a maximum resolution of 1,024 by 768 pixels. The main reason for the inclusion of both types of ports is that the unit is popular in Europe, where 9-pin monitors are still widely sold. Nevertheless, it's a nice bonus if you still have a 9-pin monitor kicking around—although you cannot run two monitors simultaneously. You choose which port you're using with a switch mounted near the ports. Our review unit came with Copam's 1400-30LR, a low-radiation Super VGA model that supports a maximum resolution of 1,024 by 768. All controls are located on the front of the unit, and it comes with a tilt/swivel stand for easy positioning.

The B Series processor performance varied depending on which CPU board was installed. With the 16-MHz 386 CPU board, the B Series was 0.25 seconds behind the 16-MHz ALR SX PowerFlex, the only other 16-MHz 386SX system tested. It fell in the middle of the pack among 33-MHz 386 systems and was just 0.01 second behind the fastest 25-MHz 486 system, the Amkly 486/25.

At the time of this review, B Series units with the 16-MHz 386SX and 25-MHz 386 CPU boards installed had FCC Class B approval. According to Copam, Class B approval is pending on systems with the 33-MHz 386 and 25-MHz 486 CPU boards.

Copam backs the system with a one-year warranty on parts and labor. You'll get free on-site service from TRW during the first year—unusual from a company that sells through retail channels. Toll-free technical support is available from 6:00 A.M. to 6:00 P.M. P.S.T.

The B Series' expansion capabilities

may be too limited if you're looking for a system to pack with boards or disk drives. Otherwise, the B Series' wide spectrum of CPU boards, its relatively painless CPU upgrade procedure, and its reasonable prices make the Copam B Series a solid choice.

DELL COMPUTER CORP.

Dell System 333P

by John R. Quain



As Dell Computer Corp.'s \$3,519 upgradable Dell System 333P demonstrates, options can make all the difference. In its standard configuration, the 333P's performance is unimpressive. But when the company's optional \$299 processor cache is installed—bringing the total price to \$3,808—the 333P's marks jump, rivaling other machines in this group.

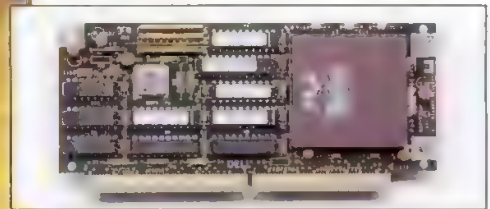
SNACKERS ONLY

With or without the optional cache, the 333P is not a meal for power-hungry users. Wrapped in a slimline case (4.3 by 15 by 16.2 inches), the 33-MHz 80386DX ISA system includes 4MB of SIMM DRAM (the maximum is 16MB), a 14-inch VGA monitor, and DOS 4.01. All three drive bays in our test machine were full, with a 105MB Quantum IDE hard disk, a Mitsubishi 1.2MB floppy disk drive, and a Sony 1.44MB floppy disk drive.

A small backplane perpendicular to the motherboard accommodates three full-length expansion cards. The system is

powered by an 85-watt Austec power supply—pint-sized by today's 200-watt-plus standards but sufficient for this system's limited power needs. Dell obviously intends the 333P design for users who have modest expansion requirements and need to cost-justify their purchase by anticipating a processor upgrade.

Users can currently upgrade to a 33-MHz 486DX CPU by adding a small \$1,699 daughtercard. The 333P system board itself comes populated with the 386 processor and a VLSI chip set, Western Digital VGA controller, and Brooktree RAMDAC. There's also a socket to plant a 33-MHz Intel 80387 on the motherboard.



You'll need the Dell System 333P's cache module for the best 386 performance.

NO BUY-BACK

Making the upgrade means merely installing the 486 daughter card and a new BIOS chip—well, almost. In the first place, the user is supposed to leave the old 386DX languishing on the motherboard: The new 486 BIOS will automatically disable the 386 processor. (Note that if you opt for the identical 433P system initially, it will cost you the same amount as the total 333P system price after the upgrade—but it won't come with the 80386 processor still on the motherboard.)

If you have purchased the optional 32K cache card, you will have to toss that out as well. It won't work with 486 upgrades: The cache has to be removed to make room for the upgrade card. According to Dell designers, this approach was adopted because the 486 chip comes with its own 8K internal cache. However, it further restricts the upgrade path for future chips that could enjoy substantial benefits from a larger external cache.

Furthermore, if you installed the 80387 math coprocessor, you will have to remove it—not an easy task since it sits under the tightly fitted drive bays. Worse yet, if you've installed any full-length expansion cards in the PC during its 386 tenure, they will have to be moved in order to install the processor card behind them. In fairness to Dell, this last state-

ment is also true of several other subsystems in our roundup.

As the final step in the upgrade process, the user must replace the system board's ROM BIOS chips. It's a relatively simple maneuver, but it requires care not to bend any contact points or nearby jumper pins. For all that, the installation we performed went smoothly, and the seven pages of instructions for the upgrade were sufficient.

Users who never intend to jam their PC full of expansion options may not be disappointed by the 333P's internal restrictions, but the layout means that Dell cannot optimize the rest of the system for future upgrades. Loading the 486 processor on a tiny daughtercard means that the motherboard's logic and subsystems need to anticipate future processor needs. Given the rapidity of technological advances, that may prove particularly difficult. On PC Magazine Labs' tests, the 33-MHz 386-based 333P was distinctly below average in this small crowd, running dead last and boasting above-average results only in the video benchmark test—until we added the cache card. With that card, the system performs as well as any other 386/33 in this review. The best the 486 upgrade could manage, however, was average scores on the memory and processor tests.

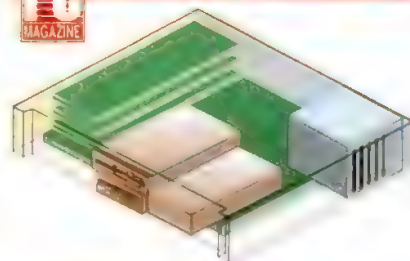
FRIENDLY

What the 333P lacks in expansion possibilities it nearly makes up for in style and ease of use. No one will ever accuse Dell of skimping on documentation: Installation, setup, and upgrade manuals supplied by the company are enough to fill a small bookshelf. And given the simplicity of the machine and Dell's toll-free technical support hot line, you may never have to turn a page. You'll even find a diagram inside the cover detailing the positions of device connectors and slots.

The slimline 333P, though, still offers only narrow appeal. But Dell is fully committed to upgradable technology. The company's line of EISA desktop and tower 486 upgradables recently began shipping. The offerings include a 20-MHz 486SX desktop system called the 420E. In a configuration matching the 333P, it lists for \$4,099 and offers the chance to upgrade to Intel's 50-MHz 486DX processor. If you're convinced that an upgradable is for you and you value Dell's service, support, and record of past performance, the 420E looks worth the \$500 more than the Dell System 333P—especially since you'll pay an extra \$300 for the external 386 cache to achieve performance you should have received in the first place.



FACT FILE



Dell System 333P

Dell Computer Corp., 9505 Aboretum Blvd., Austin, TX 78759-7299; 512-338-4400.

Processor and system prices (tested configurations): 386/33, \$3,917; 486/33, \$5,616.

Memory and processor RAM cache: 4MB 80-ns. SIMMs.

Disk drives and controller: Quantum 17-ms, 105MB IDE hard disk, Western Digital controller, 32K cache, 1.2MB and 1.44MB floppy disk drives.

Display: Western Digital 256K VGA adapter, Dell 14-inch monitor.

Software: DOS 4.01.

Processor options: 486/33, \$1,699.

CIRCLE 619 ON READER SERVICE CARD

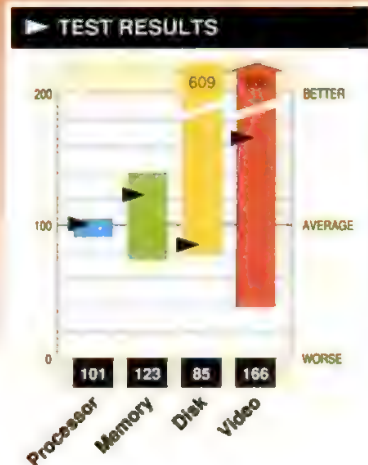
EVEREX SYSTEMS INC.

Everex Step 386 with InSTEP 486

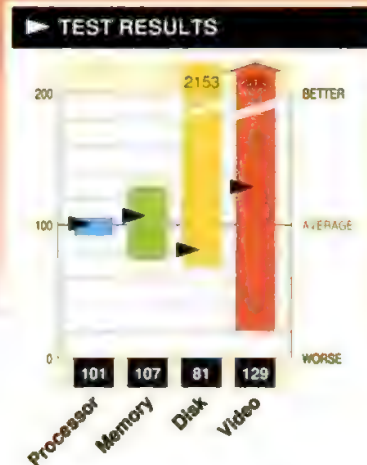
by Winn L. Rosch

Dell System 333P and 433P

Processor: 386/33



Processor: 486/33



In Short: Dell scores points where it always does—for reasonable prices, superb documentation, and top-notch support. But the System 333P's design is one of the less desirable we've come across. To achieve average 33-MHz 386 performance, you need a 32K cache card. But if you want to upgrade to the 433P, you need to discard that module, since it occupies the system's upgrade slot. The 33-MHz 386 and 486 modules are your only two processor choices.

Hey kids, don't try this at home. Upgrading the \$4,499 33-MHz Everex STEP 386 system with its complementary InSTEP 486 upgrade is serious business. Follow the directions—make sure everything lines up properly—and you'll be rewarded with excellent 33-MHz 486 performance. But Everex Systems doesn't protect you from a sloppy installation that could destroy the \$2,999 module.

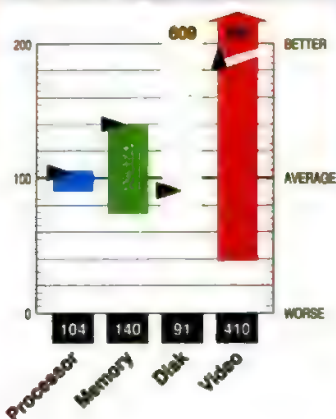
Although the latest PCs highlight upgradability as an innovation, with Everex it's more a matter of renovation. Any 20-, 25-, or 33-MHz STEP 386 computer can be upgraded with the InSTEP 486 by simply replacing the original microprocessor with an add-in board and upgrading the system BIOS. (A related product, the \$399 InSTEP 386, will upgrade 16-MHz STEP 286 computers.) Although the InSTEP 486 looks like an afterthought, Everex notes that its development started while the STEP series of PCs was being designed.

The STEP 386 was quickest on PC Magazine Labs' processor test among the tightly matched 33-MHz 386s in this

Everex STEP 386

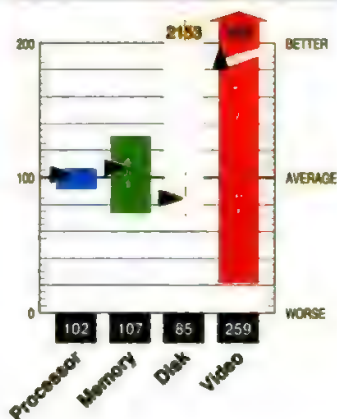
Processor: 386/33

▶ TEST RESULTS

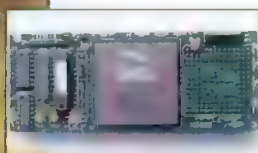


Processor: 486/33

▶ TEST RESULTS



In Short: The Everex STEP 386 with the InSTEP 486 board easily rivals any fixed-processor PC in performance, features, and price. Upgrading, however, is a tricky procedure that may be beyond the comfort level of some users: Misalign the system's InSTEP processor card and you're likely to destroy a \$3,000 part. A 256K on-board RAM cache results in better-than-average memory times; exceptional video performance derives from a Super VGA card with 1MB RAM using a Tseng chip set.



Rich in features and offering fine performance, the 386-to-486 Everex STEP rivals any desktop PC.

review. When upgraded, it acquitted itself equally well, tying for honors as fastest. Although the STEP 386's disk performance earns only a yawn, its display speed shames all other upgradables; it completed our video benchmark test in about half the time of its closest competition.

The upgrade process is as remarkable as the performance it delivers—but for less auspicious reasons. Rather than having been engineered as part of the STEP 386 design, the InSTEP 486 is more an after-the-fact solution. It's a 2- by 5.5-

inch board that pops into the 386 socket to replace the microprocessor. The good news is that this design lets STEP 386s already on the market be upgraded, so you can bring older systems up to 486 performance. The current InSTEP 486 board will upgrade 20-, 25-, and 33-MHz STEP

386s to 486s running at the same clock speed (there's no crystal on the card).

The bad news is that the InSTEP 486 is not an upgrade you'll want to make every day. It's too difficult—and too dangerous to the upgrade pieces—to take lightly. First, you must pull the old 386 microprocessor and the two ROM BIOS chips from the STEP 386 system board. But replacing the 80386 with the InSTEP 486 is a more delicate operation than it appears. Not only must you align all 132 pins of the 386-pin grid array with their appropriate holes, but you must do likewise with 24 more pins of a DIP connector. Worse yet, the system board connectors on the STEP 386 allow you to plug the upgrade one or more rows out of place without any out-

ward sign of your error—until you switch the system on.

Next you need to plug in two new BIOS chips, carefully observing their correct alignment and using the correct 28 pinholes in the 32-pin ROM sockets. If you get everything properly plugged in, the machine will boot up in its setup program and automatically configure itself for its new microprocessor.

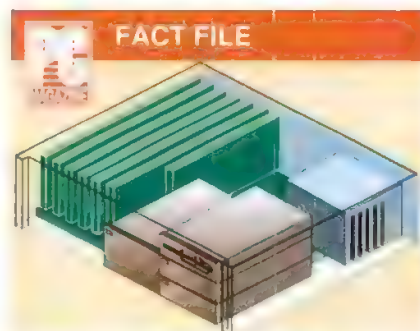
CONVENTIONAL BOX

The STEP 386 itself is quite conventional, with five half-height 5.25-inch drive bays, each with front-panel access, an XT-size system board with eight slots, and a 200-watt power supply in the right rear.

One slot is dedicated to a proprietary 32-bit memory board that accommodates all of the STEP 386's RAM—up to 16 1MB or 4MB SIMMs, for a total system capacity of 64MB. The system will also handle 16MB SIMMs when they become available. Of the remaining expansion slots, six use the 16-bit ISA interface, and the remaining one is 8-bit. The bus operates at 8, 11, or 16 MHz.

All slots are full-length, at least until you upgrade to a 486. The height of the new chip on the InSTEP 486 adapter interferes with the 8-bit slot and one 16-bit slot, limiting these two slots to boards no longer than 10 inches.

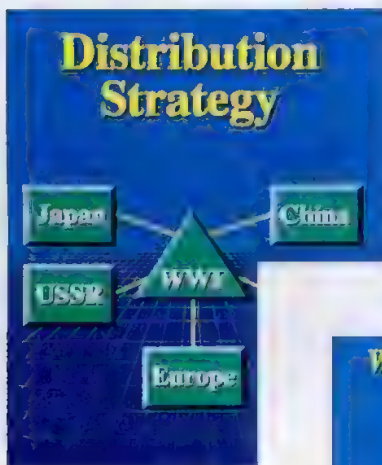
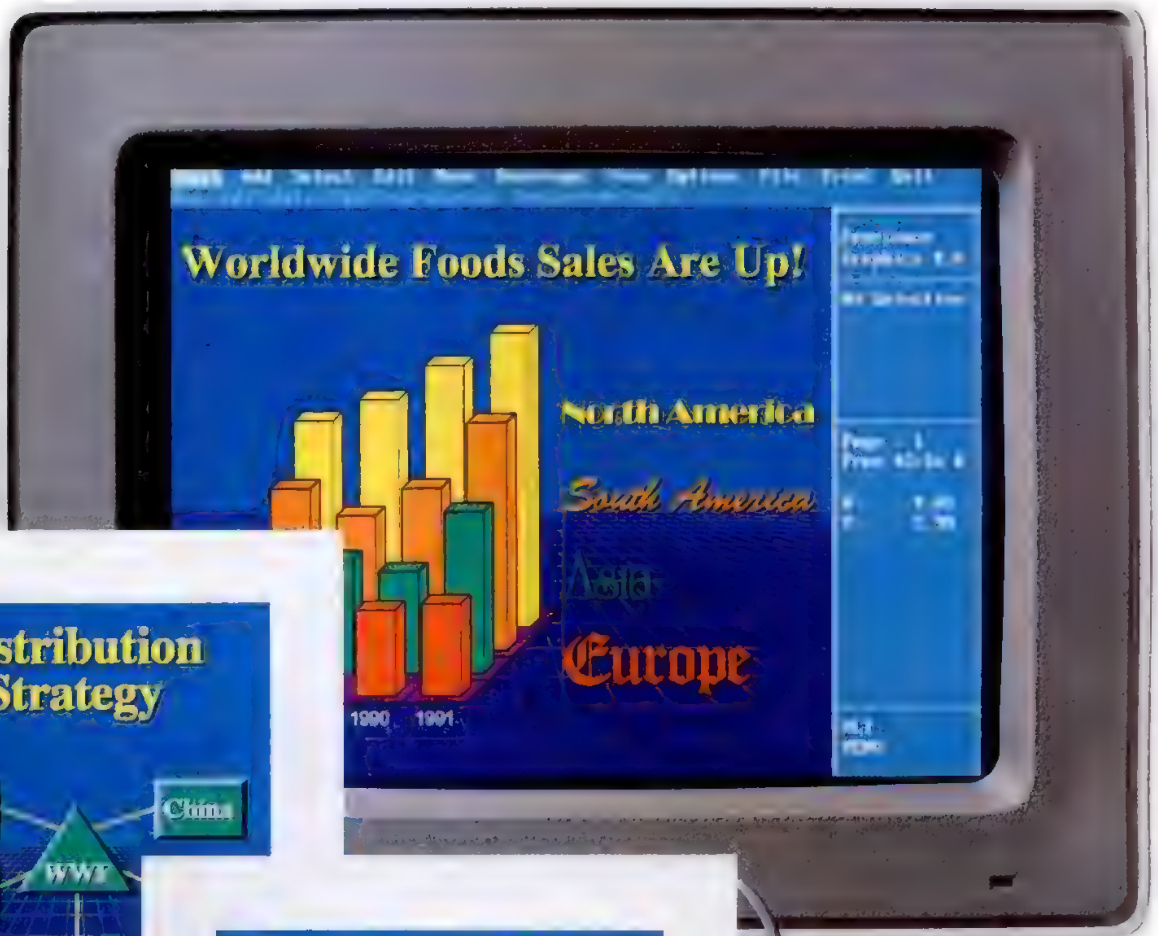
Included in the system board circuitry are the IDE hard disk drive interface, the two-drive floppy disk controller, and one



Everex STEP 386 with InSTEP 486
Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 800-356-4283.
Processor and system prices (tested configurations): 386/33, \$4,499; 486/33, \$7,498.
Memory and processor RAM cache: 4MB 80-ns. SIMMs, 128K cache.
Disk drives and controller: Maxtor 18-mb. 200MB IDE hard disk, 1.2MB floppy disk drive.
Display: Everex 1MB SVGA adapter, Everex 14-inch monitor.
Software: DOS 5.0.
Processor options: 486/33, \$2,999.

CIRCLE 611 ON READER SERVICE CARD

The new Freelanc presentations beautifully. N



-
- Defend and expand current market share
 - Identify new markets
 - Market analysis
 - Support existing sales efforts
 - Identify areas of risk in light of new competition

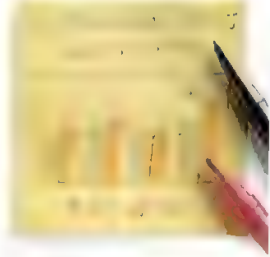
Automated Smart Features make it easier than ever to produce everything from simple word charts to impressive flow charts, diagrams and other business drawings

The new Freelanc Graphics for DOS offers a mouse-driven, WYSIWYG (what-you-see-is-what-you-get) environment where you work with actual colors and fonts while you're creating your graphics.

e Graphics creates ot to mention automatically.

Now there's a new and better version of Freelance® Plus that's so improved, we've even changed its name. It's Freelance Graphics™ 4.0. Your best presentation choice for DOS.

For starters, we've added a graphical WYSIWYG environment. Which means you'll work with actual colors and fonts while creating your presentation. And you'll know what it will look like *before* you print. With the mouse, you'll do it all—from executing menu commands to moving a chart—in record time.



Only Freelance Graphics—with its unique, automated Smart Features—can turn your ideas into a smooth presentation this easily.



Yet what's really unique about the new Freelance Graphics is its *Smart Features*. Unlike other DOS graphics programs, these *Smart Features* automate the process of turning your ideas into persuasive presentations. *Smart Features*

include: Portfolio, a built-in presentation manager; a Text Chart Outliner¹ with a spell checker for creating stacks of text charts in seconds; Auto-Charting, an easy way to produce and update weekly or monthly reports with a single command; over 1,000 Pre-drawn Symbols and Design Backgrounds; and lots more.

All of which means you can create an incredibly impressive presentation. With incredible speed and ease.

The new Freelance Graphics. It could actually have you looking forward to your next presentation.

Now 1-2-3 users have another great reason to choose Freelance Graphics.

For a limited time², you can get Freelance Graphics direct from Lotus for the upgrade price of just \$119. Which means, that 1-2-3 users now have an incredibly affordable way to enhance their presentation capabilities and

do it faster and easier than ever before.

And don't forget if you're upgrading from an earlier version of

Lotus Freelance or any other eligible graphics programs³, this limited-time offer applies to you, too.

You'll also be covered by the Lotus Technology Guarantee. Which means a guaranteed price of just \$49.00 on our upcoming Freelance Graphics for Windows™ product.

Who is eligible for this offer?

- Lotus 1-2-3 and Symphony users.
- Lotus Freelance and Graphwriter users.

- Harvard Graphics® and other graphics products users.

For more information, or to purchase Freelance Graphics, call our toll-free number today.

Please have your credit card and eligible product package ready when you call. Available at participating authorized resellers.

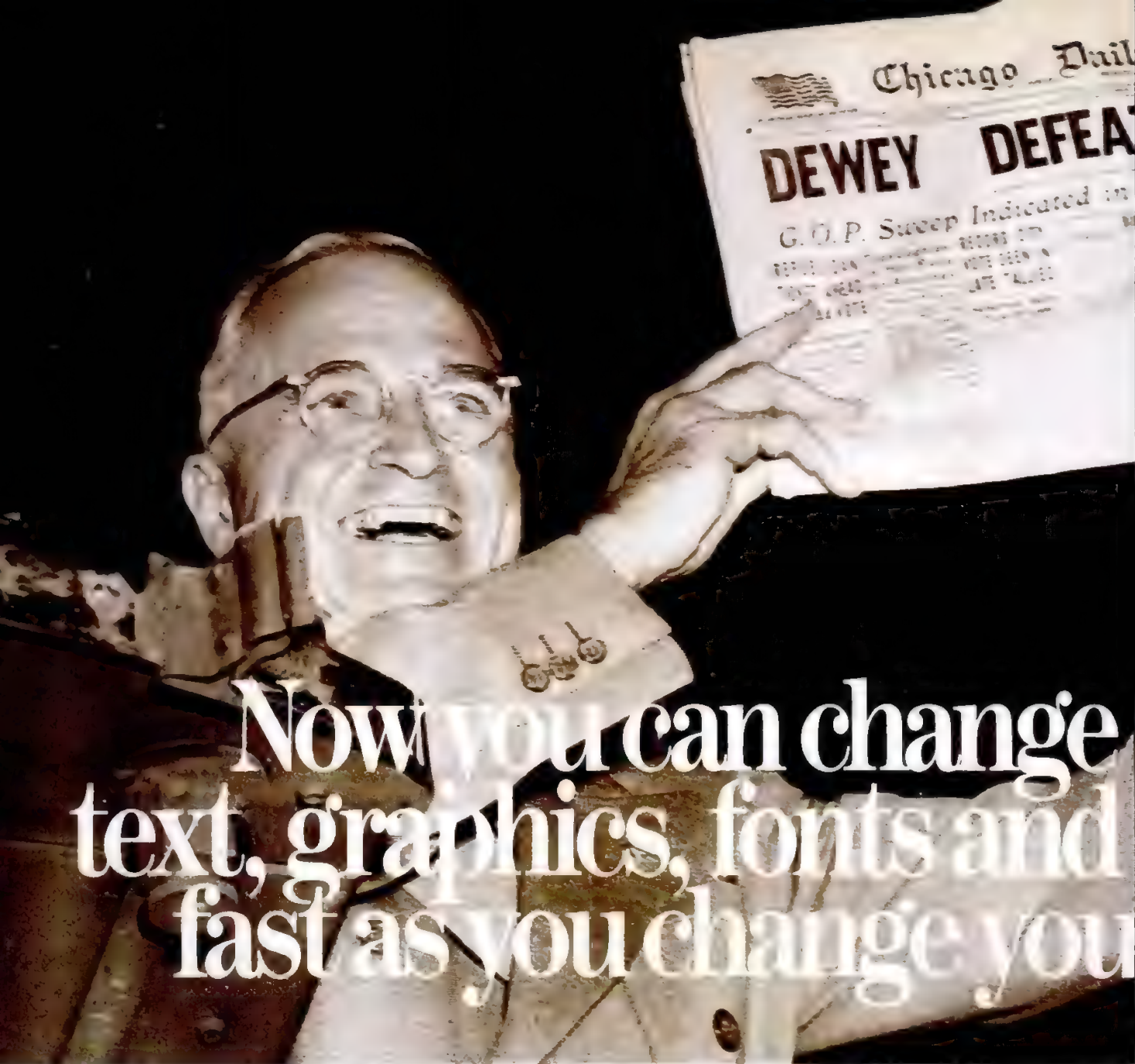
**CALL
1-800-TRADE-UP
EXT. 6200.**

Freelance Graphics

¹Developed by Symantec Corporation, especially for Freelance Graphics. ²Offer expires December 31, 1991. ³Eligible products for upgrade offer include all versions of the following products: Lotus Freelance Plus or Graphwriter, Harvard Graphics, Draw Perfect, Applause II/Draw Applause, Graph Plus, Charisma, Microsoft Chart, Parie, Gem Series, Chart Master and Diagram Master.

Freelance Graphics for DOS

Lotus



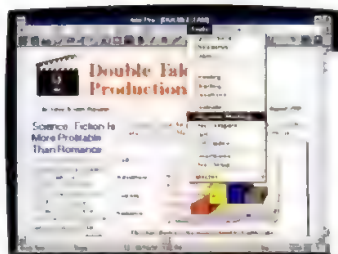
Now you can change
text, graphics, fonts and
fast as you change you

AA



With Ami Pro™ 2.0 for Windows™, you can now get letter perfect, picture perfect documents in half the time, with half the effort. We call it Visual Word Processing, and it's the fastest, easiest, most direct way to get what's on your mind on paper.

With Visual Word Processing, you work directly on



With WYSIWYG on-screen formatting, you can add charts, scanned images, and even free-hand drawings, and then wrap text around any graphic you want.

screen with SmartIcons™ that give you one-click access to every word processing feature you need or want, from basic commands to customized procedures. As you make choices in fonts, type sizes, colors and even page layouts, Ami Pro

In Canada, call 1-800-658-1509 © 1991 Samna Corporation, a wholly owned subsidiary of Lotus Development Corporation. All rights reserved. Ami Pro is a trademark of Samna Corporation. Windows is a trademark

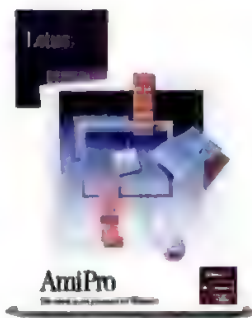




your
format as
r mind.

guides you every step of the way with visual cues so you can easily create everything from simple memos to complex reports.

Award-winning Ami Pro not only enhances the way you work, it also enhances the work you create.



Ask about our
Lotus Videos, "Ami Pro
Made Quick and Easy."

information or call 1-800-831-9679, ext. 6260 for a free working model.

Introducing Ami Pro 2.0 for Windows



© Microsoft Corporation. SmartIcons is a trademark and Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. *Suggested retail price. Offer expires December 31, 1991.



parallel and two serial ports. Everex offers an entire line of VGA adapters from which to choose; the tested system included a \$699 Everex ViewPoint VRAM VGA—a 16-bit trans-VGA adapter with 1MB of RAM installed that is capable of resolutions up to 1,280 by 1,024. The matching EverSync SVGA color monitor costs \$699. For tighter budgets, you can install an Everex ViewPoint Standard VGA adapter for \$98. Also included as standard equipment in the STEP 386 are an Everex 400-dpi mouse, *Microsoft Windows* 3.0, and DOS.

The STEP 386 system board provides a socket for a 387 or Weitek 3167. An optional daughtercard allows both to be used simultaneously.

To help protect your investment beyond the upgrade path, Everex offers a one-year parts-and-labor warranty that includes on-site service by National Computer Systems. The STEP system has an FCC Class B certification.

We wish Everex had designed the STEP 386 so there would be no risk of destroying the InSTEP 486 upgrade module: Either it should plug in correctly or it shouldn't plug in at all. Until Everex changes the design, less skilled users should leave the upgrade to skilled coworkers or dealers. If you can live with this flaw, you'll find that Everex has produced a superior upgradable system.

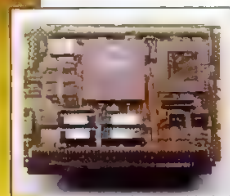
REPLY CORP.

Reply Model 32

by Gary Berline



The Reply Model 32 upgrades from 386SX to 486 and provides a second Micro Channel option.



and source advantage for RAM upgrades.

MORE THAN ENOUGH POWER

The Model 32's diminutive power supply delivers 200 watts—more than enough to drive every device the box can hold in its five full-length 32-bit slots and its five total drive bays (one full-height, two half-height, and two 3.5-inch form factor). The Micro Channel motherboard-based IDE connection supports only one hard disk.

The generally clean system board and

processor cards make heavy use of surface-mounted components but contain several engineering-change wires, indicating last-minute monkeying with the hardware. Worse, a BIOS bug prevented the VGA controller from switching into 16-bit mode, causing the Model 32 to lag well behind its peers on our video benchmark test. A utility the company sent allowed proper operation, however, vastly improving the video performance. Reply promises a free BIOS upgrade for current owners by the time this issue comes out.

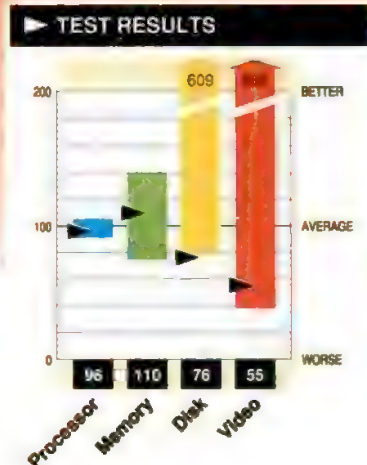
The 19-millisecond-rated 120MB Conner hard disk performed poorly on PC Magazine Labs' disk test. Also, the lack of a secondary processor RAM cache on 486 modules holds the Model 32 back, but our tested unit still performed roughly the same as similarly configured systems, both upgradable and conventional.

SIMPLE UPGRADE

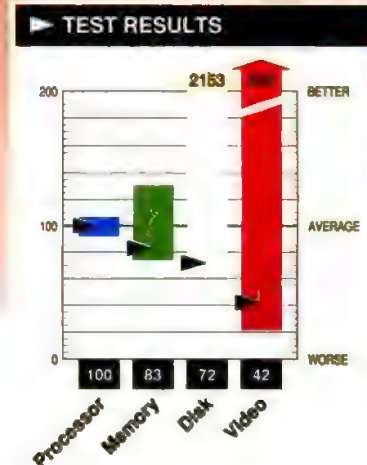
Reply's proprietary CPU modules plug into a special motherboard connector—a simple operation for most users. The entire upgrade process from cover-off to cover-on took us less than 2 minutes. It required no tools and needed no jumpers set, DIP switches flipped, or configuration utilities run. Reply's single-card CPU

Reply Model 32

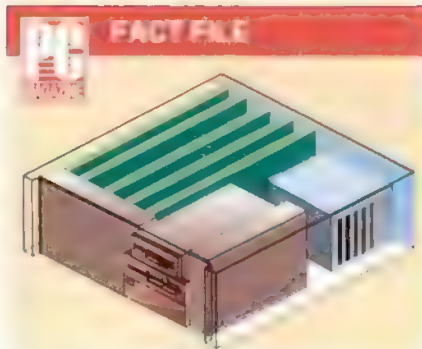
Processor: 386/33



Processor: 486/33



In Short: A cleverly designed machine that takes up little space but packs in lots of features and conveniences, the Reply performs decently but falters a bit on disk access: Our test unit showed some signs of being less than ready for the market. Still, the system rates a look as an alternative to traditional fixed-processor computers, especially for followers of the Micro Channel gospel.

**Reply Model 32**

Reply Corp., 4435 Fortran Dr., San Jose, CA 95134; 800-955-5295, 408-942-4804.

Processor and system prices (tested configurations): 386/33C, \$6,139; 486/33, \$8,139.

Memory and processor RAM cache: 4MB 80-ns. SIMMs, 128K cache.

Disk drives and controller: Conner 19-ma. 120MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Chips and Technologies 512K 1,024-by-768 circuitry, Seiko 14-inch monitor.

Software: DOS 5.0.

Processor options: 386/25C, \$995; 386/33C, \$1,495; 486SX/20, \$1,795; 486/25, \$1,995; 486/33, \$2,495.

CIRCLE 612 ON READER SERVICE CARD

modules hold the processor, one socket for either a Weitek or Intel coprocessor, and whatever cache memory may exist, along with its controller.

When it comes time to make the upgrade, you'll find that the machine exhibits design flaws that result, apparently, from a failure to follow through on clever ideas. Three knurled screws hold the cover on, making its removal a snap. Fasteners on the CPU module and the Micro Channel IDE drive allow nearly instant replacement of either without tools. Nothing holds the specially designed screws in, however, making their loss nearly inevitable—which is exactly what happened during our tests, in fact.

The entry-level Model 32, a 20-MHz 80386 with 4MB RAM, 32K of 20-ns. cache RAM, a 120MB Conner hard disk, a 1.44MB floppy disk drive, a 14-inch Seiko CM-1450C color monitor, and DOS 5.0, costs \$4,639.

The price of upgrades depends only on the new CPU card, not the difference between it and your former processor. Reply takes the old module back as part of the deal. \$995 buys you a 25-MHz 80386 with 64K of on-board cache. \$1,495 buys one of our tested modules: a 386/33 with a 128K cache. For \$1,795 you can purchase the 486SX/20. A 486/25 model costs \$1,995, and \$2,495 buys the 486/33, the other board we tested. Although not

the low-cost leader, the Model 32 compares well with the other entries in our round-up, especially considering its many integrated features. Its price falls far below similar PS/2 systems.

All of Reply's machines except the 386/20 carry FCC Class B certification. The company backs its systems with a one-year warranty, on-site support, and free phone help via a toll-free number.

Reply sells direct and offers corporate discounts from 35 to 40 percent based on volume, making a moderately priced entry even more attractive. A wide range of processor options, as well as disk drives and other peripherals, enable this machine to serve in the varying capacities a large company often demands. The Reply Model 32's overall performance could stand a bit of a boost, yet the unit's smart physical design facilitates both upgrades and service.

TANDON CORP.**Tandon Option**

by Winn L. Rosch



Tandon's processor modules make upgrading as easy as inserting a floppy disk.

Tandon prices the Option by summing the cost of its constituent parts. You don't need a calculator to see that this Option pricing adds up fast. For example, you can buy a complete system board for a fraction

of the price of an Option microprocessor module. And you can buy a complete 286-based PC for little more than the base unit alone. The minimal system lists for \$1,790 without a hard disk, or a full \$2,105 with Tandon's smallest drive (40MB).

Unlike other vendors such as Copam, Tandon has no trade-in policy for old microprocessor modules. Instead, the company envisions dealers developing their own recycling plans. That policy begs a troubling question: If you're going to rely on the dealer to exchange upgrades, why not just let him or her tackle

Tandon Corp. has followed the pulse of the computer industry for 16 years, starting out as a parts supplier for floppy disk drives (in 1975), making the drives themselves (in 1978), and then making hard disks and PC-compatible systems (both in 1984) as demand arose. Now the company sees PC buyers favoring upgradable systems to protect their PC investments against galloping obsolescence.

The Tandon Option is Tandon's latest market response, a small-footprint PC that

makes microprocessor or hard disk upgrades as easy as sliding in a Nintendo cartridge. Convenience has a price, however, and the sturdy Option extracts a premium for its upgrade microprocessors. Nor does the clever design make it any easier to add more-mundane internal options such as expansion boards. But, Tandon does take the user upgrade path a little further than others, allowing you to upgrade your hard disk with the same ease as you might replace the processor module.

The essence of the Option is its microprocessor module, a 6- by 7.75-inch metal-cased cartridge just 5/8 inch thick. Inside the cartridge are the microprocessor, coprocessor (if any), cache (if any), and a few support chips. The 9- by 11-inch system board holds the BIOS and main memory and a wealth of input/output circuitry, including the IDE connection, floppy disk controller, Super VGA display adapter, and one parallel and two serial ports.

Tandon offers a complete series of microprocessor modules, including a 286/12 (\$795), a noncached 386SX/20 (\$1,165), the same with a cache (\$1,390), a 486SX/20 (\$1,795), and a 486/33 (\$2,495). An \$895 base unit, which includes the system board, 1.44MB floppy disk drive, keyboard, and chassis as well as a monochrome VGA display, DOS, *Microsoft Windows*, and *Microsoft Mouse*, is required to make a complete PC.

the work of installation, too?

On the other hand, no PC is as easy to upgrade from one microprocessor to another as the Option, should you elect to do the work yourself. It takes about 10 seconds. Pop two releases on the bottom of the 5- by 18- by 16-inch case and the plastic front fascia panel comes off to reveal the module slot and disk drives. Pull out one module, slide another into its place, and the hardware part of the upgrade is over. The first time you boot up afterward, you'll have to make a short detour through the ROM-based setup procedure, but pressing Enter will automatically get you going.

HARD DISKS MADE SIMPLE

Adding or upgrading a hard disk is equally easy with the Option. Using a proprietary metal mounting sled, the primary disk quickly slides into place in seconds in a 3.5-inch bay next to the microprocessor slot, without your having to worry about wiring.

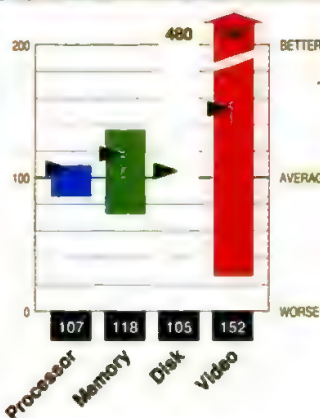
All Option hard disks are optional but competitively priced. Available capacities include 40MB (\$315), 80MB (\$345), 110MB (\$535), 200MB (\$725), and 400MB (\$1,595). The 200MB Maxtor drive in the tested system delivered above-average performance.

The two half-height 5.25-inch floppy disk bays use snap-in metal rails, but

Tandon Option

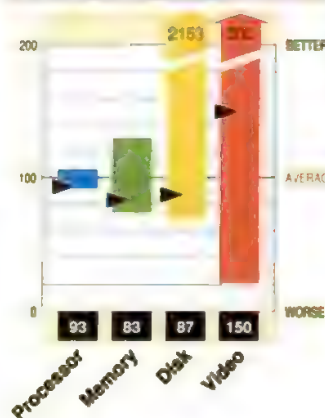
Processor: 386SX/20

► TEST RESULTS



Processor: 486/33

► TEST RESULTS



In Short: A plug-in processor module makes the Tandon Option stand out: Only Tandon lets you upgrade your processor through the front panel. Unfortunately, the system is built around a 286 design. Its 386SX performance was good, thanks to a built-in processor RAM cache; however, the 486 processor score was about 7 percent below average for its class, and among the slowest compared with the other upgradables in this review.

adding a second drive will require removing the top of the case to plug in the needed wires in frustratingly close quarters.

Expansion boards, too, require inside access to reach the seven horizontal ISA expansion slots: four full-length slots (three 16-bit and one 8-bit) to the left of a vertical adapter, and three 7-inch 16-bit slots on the right. Power for everything comes from a 150-watt supply.

MIXED SCORES

PC Magazine Labs tried the Option using two of its many microprocessor modules: the cached 386SX and the top-of-the-line 33-MHz 486. The 386SX module operates at 20 MHz and comes with a 32K direct-mapped cache using 35-ns. RAM chips. Even the least exotic cache was good enough to make the Tandon the second-fastest machine in its class, faster than its nonupgradable sibling.

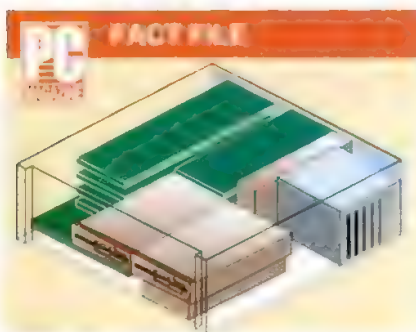
Those wanting even better performance on numeric operations can enhance the module with a 387SX coprocessor. But that's where the easy upgradability of the Option fails. To add a coprocessor to the module accommodating it requires disassembling the module. Although only four small screws hold the metal module together, you'll find yourself hands-on with a static-sensitive circuit board. Tan-

don might have simplified the process with an access cutout for adding a coprocessor chip.

The 486 module relies on that microprocessor's own internal 8K cache, augmented by Tandon's own write-posting circuitry. Even so, the 486-powered Option scored at the bottom of the 486 performance list. The reason is that the Option's base unit, unlike those of Copam, Dell, and others, has a 16-bit memory path—a roadblock to the 32-bit speed of the 486. All memory accesses must be carried out in 16-bit chunks. Yet the performance hit was small compared with the fastest machines, putting the Option far ahead of mere 386 machines and even the 25-MHz 486 competition.

Other than its price and that performance flaw, the Option stacks up well against its competition, with good workmanship, a strong and attractive design, and a one-year warranty with on-site service.

Individual buyers will probably find that the relatively high cost of the Option overrules the one-time advantage of an easier upgrade job. In business, however, the Option can be a uniquely flexible machine—one that can be quickly modified to meet the needs of any situation from a modest stock of spare parts.



Tandon Option

Tandon Corp., 301 Science Dr., Moorpark, CA 93021; 800-800-8850.

Processor and system prices (tested configurations): 386SX/20 with cache, \$3,548; 486/33, \$4,653.

Memory and processor RAM cache: 4MB 80-ns. SIMMs, 32K cache.

Disk drives and controller: Maxtor 18-ms. 200MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.

Display: Tandon 1MB 1,024-by-768 adapter, Tandon 14-inch monitor.

Software: DOS 5.0, Microsoft Windows 3.0.

Processor options: 286/16, \$795; 386SX/20 without cache, \$1,165; 386SX/20 with cache, \$1,390; 486SX/20, \$1,795; 486/33, \$2,495.

CIRCLE 613 ON READER SERVICE CARD



THE
X-12

Farnsworth & Kingston
PUBLIC RELATIONS



One of these proposals will be left in the dust.

You've spent months on a proposal, complete with text, photos and computer generated material. With a Canon Color Laser Copier, you can be sure your work will go the distance.



A Canon Color Laser Copier not only produces the world's best digital color copies and transparencies. It also takes color copying

into a new dimension with a choice of digital connectivity solutions for computer applications.

When configured with an IPU, your workstation or personal computer can take advantage of 24-bit full-color printing. And since an IPU is a

bi-directional image controller, you can make maximum use of the copier's continuous-tone color scanning and printing functions.

Or, with a PS-IPU, the copier can serve as a uni-directional color laser printer for computers or workstations which support the PostScript™ language.

Canon Color Laser Copiers. If you think you can't afford one, maybe you



can't afford to be without one. For more information, call 1-800-OK-CANON.

Canon
COLOR LASER COPIERS
CIRCLE 155 ON READER SERVICE CARD

OUR 6.4 POUND COMPUTER JUST GOT A LOT LIGHTER.

*Performance Enhancements: Within the first megabyte of memory, 96 KB of memory is reserved for use by the system to enhance performance. Can be optionally disabled. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. **Payment based on 36-month, open-end lease, leasing arranged by Leasing Group, Inc. In Canada and Mexico, configurations and prices may vary. Dell is a registered trademark of Dell Computer Corporation. 1997. © D. Power and Associates. Computer End User Satisfaction Study, Phase I: Office Based, Small to Medium Sized Businesses™ Responses from Business End Users at 1,784 business sites. Small to Medium Sized Businesses were based on office sites with between 1 and 499 employees. Best Personal Computer in Office Based End User Satisfaction in Small to Medium Sized Businesses. © D. Power and Associates is a service mark.

Most computer companies give you reductions on slow moving computers. At Dell, we give you reductions on award-winning ones.

After our 320N notebook won *PC Magazine's* Editors' Choice, we dropped its price by \$900.

While that may sound amazing, it's even more so when you hear the kind of things those editors had to say: **"Dell keeps getting it right." "Everything about this computer... inspires confidence."**



Engineered to tackle the most demanding tasks, the Dell® 320N is an i386™ SX system that runs at 20 MHz.

While it delivers a lot of power, it sure doesn't use much. In a *PC Magazine Labs* test, our notebook led the 20 MHz field in battery life, with over 3 hours of power.

When the time finally comes to replace the battery, Dell's "Continuous Power Battery System" will let you do it without even leaving your application.

But superb power management isn't all that makes

this notebook the "ideal road machine," as

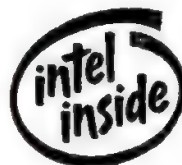
TO ORDER, CALL, PLEASE REFERENCE #11BL4.
800-545-9687
HOURS: 7AM-9AM CT M-F 8AM-4PM CT SAT
IN CANADA 800-668-3021 IN MEXICO 95-800-010-0664

PC Magazine calls it; there's our unmatched service and support.△

And the fact that Dell was ranked "best" in J.D. Power and Associates' Customer Satisfaction index for PCs in Small to Medium Sized Businesses.™ So call 1-800-545-9687 today. And ask for our highly-praised computer. At this price we're practically dropping it in your lap.



THE DELL 320N i386SX 20 MHz SYSTEM.
THE SYSTEM INCLUDES 40 MB HARD DRIVE, AND 1 MB RAM.*
\$2,499. LEASE: \$93/MO.**



of J.D. Power and Associates' i386 and the Intel Inside Logo are trademarks of Intel Corporation. Other trademarks and trade names are used to identify the entities claiming the marks and names of their products. Dell Computer Corporation disclaims any proprietary interest in trademarks and trade names other than its own. Service provided by third party service. On site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-day Total Satisfaction Guarantee, limited warranty and third party service contract please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299 ATTN: Warranty. ©1991 Dell Computer Corporation. All rights reserved.

CIRCLE 502 ON READER SERVICE CARD



THE NEW DELL® 320SX 20 MHz i386™ SX SYSTEM.
SYSTEM INCLUDES VGA COLOR PLUS
MONITOR, 40 MB HARD DRIVE, 1 MB RAM.*

So you're looking for i386SX technology. And you don't like the thought of needlessly spending an extra thousand dollars or so.

Well, we have a suggestion for you: the Dell 320SX.

For only \$1,999.

wouldn't expect in a small footprint.

The Dell 320SX comes standard with a high resolution video monitor, 40 MB hard drive and 1 MB of RAM. It also has an optional 16 KB cache that can boost performance by up to 10%.

Service, service, and more service.

And there's our service. The service for which we've consistently won PC Week's Corporate Satisfaction Poll for PCs, laptops and servers. An unprecedented eight times.

Get the right tool for the right job.

When you

call us, we'll

help you decide on the perfect system.

We'll custom configure it, build it, test

it, then ship it to your home or office

via two day air standard. We're so

confident in our systems that you

If you have any problems, our toll-

free technical

support hotline

solves 90% of reported problems right

over the phone, usually in six minutes

or less. Or if you use our innovative

24-hour TechFaxSM line, we'll fax

you back Dell system information

TO ORDER, CALL, PLEASE REFERENCE #11815.

800-545-9692

HOURS: 7AM-9PM CT MON-FRI 8AM-4PM CT SAT

IN CANADA 800-668-3021. IN MEXICO 95-800-010-0664.

THERE'S A BIG DIFFERENCE BETWEEN OUR i386SX PC AND OUR COM YOU PAY UP TO \$1,000 LESS FOR

This new slim-line 20 MHz system offers the ability to run Microsoft[®] Windows[™], single-tasking MS-DOS[®], multi-tasking MS[®] OS/2[®] or UNIX[®] and other PC networking systems, and just about everything else you

get 30 days to use it.

If you aren't satisfied after 30 days, you can send it back.

We'll return your money to you with absolutely, no questions asked.

immediately. And if the problem still isn't solved, a trained technician can be at your desk-side usually by the next business day.*



This first year of on-site service is included

*Performance Enhancements: Within the first megabyte of memory 96 KB of memory is reserved for use by the system to enhance performance. Can be optionally disabled. All prices and specifications are subject to change without notice. Dell cannot be responsible for other Corporation. 386 and Intel Inside Logo are trademarks of Intel Corporation. UNIX is a registered trademark of UNIX System Laboratories, Inc. in the U.S. and other countries. MS, MS-DOS and Microsoft are registered trademarks and Windows is a trademark of Microsoft Corporation. Service provided by third party service. On site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of the Dell Service Agreement, call 800-545-9692.

A close-up photograph of a Dell monitor and keyboard. The monitor is white with a black bezel and a 'DELL' logo. Below it is a white keyboard with a 'DELL' logo and a circular button.

- Online Bulletin Board to
communicate with Dell technical
staff and other Dell users



For sale, for lease, ♦ for less. Call us

And discover how much less you
pay for our logo.

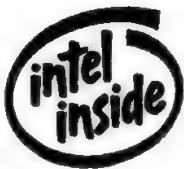
PETITORS!
OUR LOGO.

CIRCLE 470 ON READER SERVICE CARD

2. *Method* – Participants were recruited from the local newspaper. They had no previous experience with the tasks and were not compensated. Participants were screened for any physical or psychological conditions that might affect their performance. They were then randomly assigned to one of two groups: a control group and an experimental group. The control group performed the tasks without any feedback, while the experimental group received feedback after each trial. The tasks were performed on a computer screen, and the results were recorded. The data were then analyzed using a two-way ANOVA to determine the effect of feedback on performance.

**IT'S OKAY
TO PAY \$10,000
FOR AN i486
COMPUTER.**

**AS LONG AS
YOU
GET A \$5,500
REBATE.**



*Performance Enhancements: Within the first megabyte of memory, 96 KB of memory is reserved for use by the system to enhance performance. Can be optionally disabled. All prices and specifications are subject to change without notice. Dell cannot be responsible for errors in typography or photography. **Payment based on 36-month open-end lease. †Leasing arranged by Leasing Group, Inc. In Canada and Mexico, configurations and prices may vary. Dell is a registered trademark and TechFax is a service mark of Dell Computer Corporation. i486 and the Intel Inside Logo are trademarks of Intel Corporation. Windows is a trademark of Microsoft Corporation. 1991 J.D. Power and Associates Computer End User Satisfaction Study. Phase I. Office Based Small to Medium Sized Businesses. **Responses from Business End

If a penny saved is a penny earned, you could make about \$5,500 just by choosing the Dell® 433P over another leading i486™ system. The 433P comes with a

200MB hard drive, 4MB of RAM,* and a VGA Color Plus Monitor for just \$4,499.

Or you can choose the 80MB, 2MB of RAM version at \$3,999.

Either way, the Dell 433P comes with a high resolution video monitor making it ideal for Windows™, graphics and desktop publishing.

The service and support program is a bonus. According to a recent J.D. Power and Associates survey, Dell is the "Best Personal Computer in Customer Satisfaction in Small to Medium Sized Businesses."™ Which was a huge honor, yet no big surprise considering we've also won PC Week's Corporate Satisfaction Poll an unprecedented 8 times now.

For us this means prestige, for you it means a reliable PC with the best service and support in the industry.

Take our toll-free technical support hotline, where 90% of reported problems are solved,

usually in 6 minutes or less.

And, our

innovative TechFax™ line gives you system information 24 hours a day. Plus an electronic bulletin board lets you log in and see other users' questions with Dell's answers.

If these don't solve your problem, a trained technician can be at your desk-side usually by the next business day.△ This one year on-site service contract is included in the system price.

You get the credit. The Dell Direct Advantage MasterCard offers a credit limit up to \$15,000 and a way to earn points toward Dell

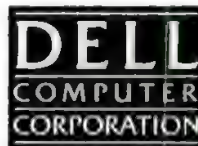
HERE'S THE SUPPORT YOU'LL GET.

- ~ Toll-free technical support hotline for the life of your system.
- ~ One full year of on-site service included in the system price.△
- ~ Self-diagnostic software.
- ~ Toll-free 24-hour TechFax line for instant access to Dell technical information.
- ~ On-line Bulletin Board to communicate with Dell technical staff and other Dell users.

products with everything you buy.

A variety of financial products are also available that can be tailored to meet your business needs. For instance, you can lease^o the Dell 433P for as little as \$136 a month.

Call us. It's free. Just describe your needs and we'll help configure the right system for you, custom-build it, test it and ship it to you. Each Dell system



comes with a 30-day no questions asked money back guarantee and one-year limited warranty.

So, order your Dell 433P today. You've earned it.



THE NEW DELL 433P 33 MHz i486 SYSTEM.
SYSTEM INCLUDES VGA COLOR PLUS MONITOR, 40 MB HARD DRIVE, 2 MB RAM*

CIRCLE 480 ON READER SERVICE CARD

Users at 1,704 business sites, Small to Medium Sized Businesses were based on office sites with between 1 and 499 employees. Best Personal Computer in Office Based End User Satisfaction in Small to Medium Sized Businesses. J.D. Power and Associates is a service mark of J.D. Power and Associates. Other trademarks and trade names are used to identify the entities owning the marks and names or their products. Dell Computer Corporation disclaims any proprietary interest in trademarks and trade names other than its own. △Service provided by third party service. On-site service may not be available in certain remote locations. Shipping, handling and applicable sales tax not included in the price. For information on and a copy of Dell's 30-day Total Satisfaction Guarantee, limited warranty, and third party service contract, please write to Dell USA Corporation, 9505 Arboretum Boulevard, Austin, Texas 78759-7299, ATTN: Warranty. © 1991 Dell Computer Corporation. All rights reserved.

Upgrade Today...

SX/Now!™ PROCESSOR UPGRADES

286 to 386SX Processor Upgrades

- ◆ Onboard Cache Memory & High Speed Clock
- ◆ Requires NO Expansion Slot
- ◆ 80387SX Co-Processor Socket
- ◆ **NOW** available for:
 - ◆ IBM-AT
 - ◆ PS/2 25/286, 30/286, 50, 50z, 60



MEMORY UPGRADES

Memory for: IBM, Compaq, Toshiba, Apple, HP, AST, Dell, DEC, Epson, NEC, SUN, Zenith, AT&T, Sharp, NCR, Silicon Graphics, Everex, TI and other CPU's & Printers.

DRIVE UPGRADES

Drive upgrades for: PS/2's, Compaq's, AT's, SUN, DEC, IBM Risc, Macintosh, plus SCSI Adapters and Drives.

What makes Sigma Data your best source for **Kingston** TECHNOLOGY CORPORATION products?

- ◆ Knowledgeable Sales & Support
- ◆ 5-Year Warranty
- ◆ Immediate Shipping
- ◆ 30-Day Money-Back Guarantee

ΣSigma Data

P.O. Box 1790, New London, NH 03257 ♦ NH (603)526-6909 ♦ Fax: (603)526-6915

VISA, MC, AMEX, COD & Qualified PO's accepted. All brands and trademarks are the property of their respective holders.

1-800-446-4525

Profit from over 10 years of experience

SX TRANSPLANTS

The Band-Aid Fix

BY BILL O'BRIEN

It's a great idea on paper: inexpensive 80386SX CPU upgrades that drop into AT-class PCs. But PC Magazine Labs finds more than a few problems with these five products, including mediocre performance.



ILLUSTRATION: MIN JAE HONG

Technology has left the 80286 behind, but fortune may have left you with your old AT. What do you do?

Assuming you admit it's time to upgrade, you have several alternatives: You could spend \$2,000 or more on a new 386-based computer. You could wire your old peripherals to a new 386SX motherboard. Or you could take the simplest route and buy one of the 386SX upgrade cards that have recently entered the market.

This last option is the least ideal because it gives



SYSTEM PERFORMANCE: A GUIDE TO THE GRAPHICS

BENCHMARK TESTS

The Bars

These charts show each product's scores on four tests relative to the best, worst, and average scores of previously tested products in the same processor class. Each colored bar represents the range of test scores for non-upgradable systems in our database, from fastest to slowest. The longer the bar, the wider the range. If the best score is more than twice as fast as average, an upward-pointing arrow appears atop the colored bar.

A black arrow on each bar represents the given system's position relative to the historical range. The higher the arrow, the better the performance. If a system performs more than twice as fast as average, the black arrow appears at the top of the bar, pointing upwards.

The Boxes

A normalized score appears in the box below each colored bar. To derive this figure, we calculated the average score for all nonupgradable systems of the same processor type reviewed in *PC Magazine* over the past year. We then divided this average by the score of each machine in turn and multiplied by 100. In all cases, the normalized score is based on the average performance of systems running at the same processor level as the machine tested.

Thus the average score is 100; a number greater than 200 indicates that a system performed the test in less than half the average time; a number smaller than 50 indicates that the system took more than twice as long to complete the test.

A table of actual scores accompanies the three-dimensional bar charts.

Best score

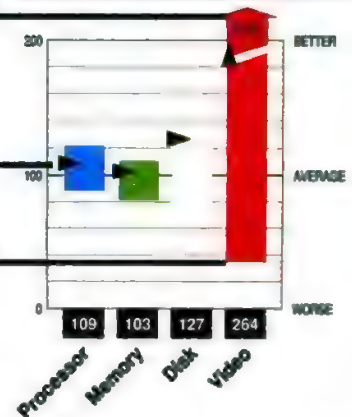
(previously reviewed products)

TEST RESULTS

Product's score

Worst score

(previously reviewed products)



you only a small increase in processor performance. However, it's the one you're likely to be most comfortable with because it's often the least costly—and surely the least time-consuming. An upgrade card provides the easiest path to higher megahertz ratings; it will also allow you to take advantage of multiple sessions and protected-mode memory in applications for the 386 processor family. Even if you have no use for expanded memory managers and multitasking software environments, *Microsoft Windows 3.0* boasts a wide range of applications and facilities that simply can't be run to their full effect on an 80286.

PC Magazine Labs was able to locate five PC upgrade cards: Aox's StaX SX, Cumulus Corp.'s 386SX Card, Intel's SnapIn 386, Kingston Technology's SX-Now!, and Microway's FASTCache-SX. A sixth card, from SOTA, was requested but could not be supplied in time for this review. These boards range in price from a low of \$299 for the Cumulus 386SX Card (bundled with a copy of *Windows*) to \$595 for Microway's FASTCache-SX/Plus, which has a variety of options that bump it all the way up to almost the level of a computer on a card.

Compare these prices with the current \$2,000 cost of a typical 20-MHz 386SX PC (with 2MB of RAM, an 80MB hard disk, and color VGA display) from a mail-order vendor, or even the \$350 to \$650



EDITORS' CHOICE

None measure up

None of the 386SX/20 upgrade cards we tested for this review performed at 20-MHz levels, though most did boost the processor performance over that of the AT. Even if you chose the card from the company that knows processors best—Intel's SnapIn 386 (\$495)—you would be able to upgrade only an IBM PS/2 Model 50 or 60. And cards that give you a wider selection (like Aox's \$329 StaX SX or Microway's \$595 FASTCache-SX/Plus) can't compete with true 386SX PCs.

The biggest hurdle these cards fail to clear is in disk and video performance. If you're stuck with an EGA display or a small, underpowered hard disk, no processor will make your system palatable for running video- and disk-intensive applications as they were meant to run. Your best bet: Bank the \$300 to \$600 you would have spent on an upgrade card, donate your AT to charity, and apply the savings to the 386SX you really need.

prices for 386SX to 486DX motherboards. You'll find that upgrade boards are less costly. But when you consider that despite their 20-MHz ratings, none of these upgrade boards doubled the processor speed of the 10-MHz IBM PS/2 Model 60 we used as a test-bed—or ran two and a half times as fast as the 8-MHz PC AT—you might begin to have second thoughts.

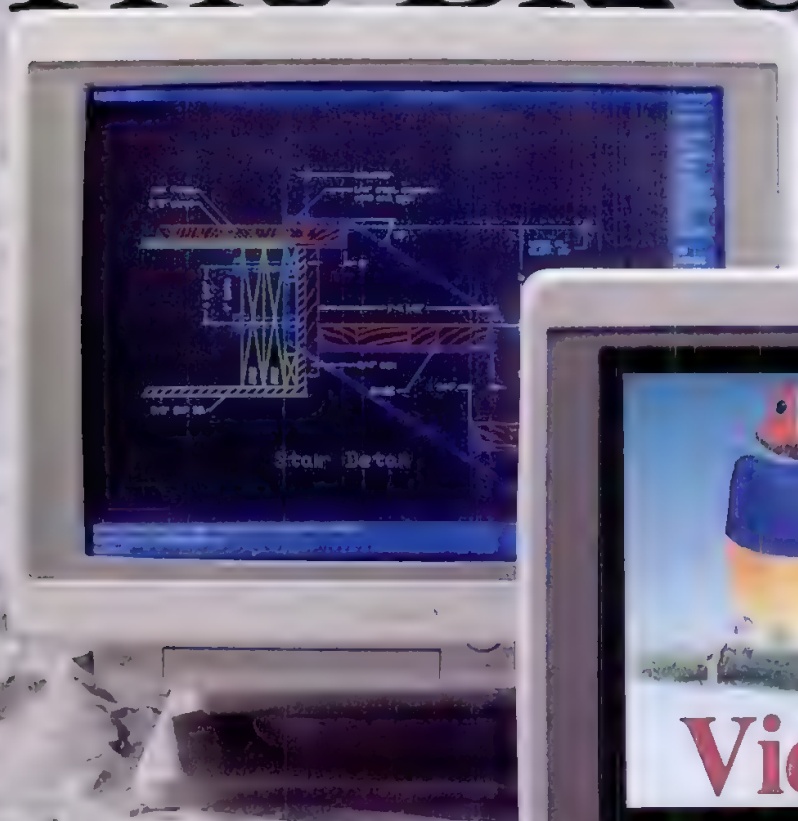
NO GREAT IMPROVEMENT

This has always been the case with upgrade boards—even the past generation, which converted XTs to ATs. The attractiveness of the cards' pricing is offset by their lack of equivalent performance. But for many people, cost savings (over a completely new computer and simplicity of installation (compared with replacing a motherboard) overshadow poor performance. Even the lure of brand-new, state-of-the-art equipment (with similarly brand-new warranties) cannot overcome the appeal of these two factors.

Most of the vendors offered either pin grid array (PGA), plastic leaded chip carrier (PLCC), or leadless chip carrier (LCC) versions of their boards to match the variety of socket types you'll find in 80286 computers. Generally, the original IBM PC AT (both 6-MHz and 8-MHz models) used a PGA socket; the IBM PS/2 Model 30/286 and most of the AT compatibles contain PLCCs; and some of the faster AT compatibles that arrived

The Big Screen

ViewSonic 7 Rated
#1 by InfoWorld!



20-Inch



ViewSonic 7

17-Inch

These two new 1280 x 1024 ultra high resolution monitors will soon be in offices all over the world. That's because they're so *powerfull*

Consider this: Our 17" and 20" non-interlaced microprocessor-enhanced monitors will automatically adjust the image the way you want. There are 16 preset modes which can be programmed by the end-user. With built-in memory, these monitors do what you want...and they don't forget. Plus the crystal clarity and sharp focus on the non-glare, anti-static screen are simply unbeatable. NO distortion and low radiation. The ViewSonic 7 even has a flat/square screen.

The ViewSonic 7 (17") and ViewSonic 8 (20") feature a new level of high performance for desktop publishing, CAD/CAM and other graphics-intensive applications. They are designed for PCs, Mac II and Sun systems.



Visit your dealer TODAY and see for yourself why **ViewSonic** monitors, from the 14" to the 20", are becoming a standard in offices throughout the world.

ViewSonic

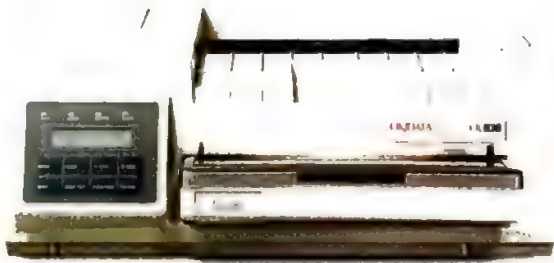
12130 Mora Drive
Santa Fe Springs, CA 90670
(213) 946-0711 (800) 888-8583

Fax (213) 946-1618

All products and brand names are trademarks of their respective companies.

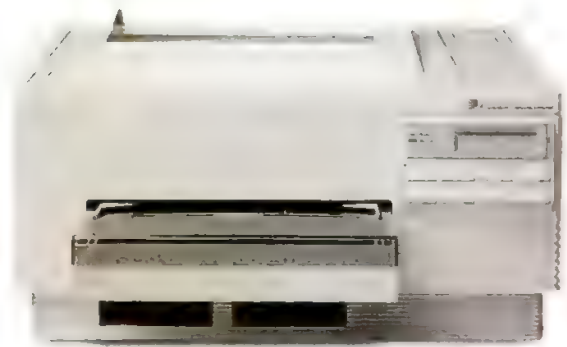
CIRCLE 118 ON READER SERVICE CARD

The new OL830 had to be smarter than the LaserJet III to earn the Okidata OK!™



Smart.

- **Smart price: \$1999⁰⁰***
- Gives you the best font scaling and graphic output from over 5000 different software applications.
- Offers 17 scalable plus 26 bitmapped fonts, standard.
- 2 megabytes of memory for full-page graphics.
- Optional second paper tray for second sheets, alternate letterhead.
- 5-year printhead warranty. (Plus 1 year parts/labor on entire printer.)



Not So Smart.

- **Not-so-smart price: \$2395⁰⁰***
- Only supports font scaling and graphics from a few hundred software applications without expensive brain surgery.
- The best it can manage without costly add-ons is 8 scalable and 14 bitmapped fonts.
- 1 meg is all you get, standard. Can't even remember one full page of graphics.
- No place to add a second tray. You're stuck with only one kind of paper at a time.
- Standard 1-year warranty. Not so smart.

If you think buying the smartest 8 page-per-minute business printer is a smart business move, we think you'll agree Okidata's new OL830 is a stroke of pure genius.

It Takes Brains To Make A Smart Printer.

Okidata's newest printer takes just about every important feature of the LaserJet III and adds an IQ boost all its own. The OL830 offers more typefaces and fonts for better-looking documents, and more standard memory for full-page graphics. An optional second paper tray fits underneath to switch between letter-head and second sheet, or plain paper and envelopes, without reloading. And the OL830's 5-year printhead warranty is the longest in the industry. All for a suggested retail price that's hundreds of dollars less than the LaserJet III.

So Smart, It Already Knows Your Software.

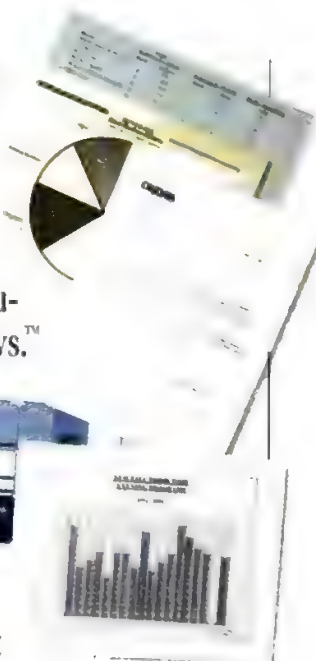
To give our smart printer even more smarts, we include Printer Control Panel™ autoswitching software from LaserTools®—a \$149 value. By switching automatically between *both* major printer emulations (Adobe's® PostScript® and HP® LaserJet), the OL830 will deliver superb output and

dazzling graphics with WordPerfect®, Lotus® 1-2-3®, Harvard Graphics®, or just about any software package, present or future, DOS or Windows.™ Since it's also fully Novell® network-compatible, users on a LAN can send output from different applications at any time without printer headaches.

Our Smartest Feature: The Okidata OK!

Most important, the OL830 comes with the Okidata OK!—our personal pledge that your new Okidata printer will provide not just adequate performance, but exceptional performance—not merely good value, but outstanding value.

For additional information, or the name of an Okidata dealer in your area, please call us at 1 (800) OKI-DATA.



We don't just design it to work. We design it to work wonders.™

*Manufacturer's suggested retail price. Dealer prices may vary. HP and LaserJet are Reg. T.M.'s of Hewlett-Packard Inc. Adobe and PostScript are Reg. T.M.'s of Adobe Systems Inc. Printer Control Panel is a T.M. and LaserTools is a Reg. T.M. of LaserTools Corp. WordPerfect is a Reg. T.M. of WordPerfect Corp. Lotus and 1-2-3 are Reg. T.M.'s of Lotus Development Corp. Harvard Graphics is a Reg. T.M. of Software Publishing Corp. Windows is a T.M. of Microsoft Corp. Okidata is a Reg. T.M. and Okidata OK! is a T.M. of OKI Electric Industry Co., LTD. "We don't just design it to work. We design it to work wonders." is a T.M. of OKI America, Inc.

later on the scene use LCCs. Even other members of IBM's 286-based PS/2 line (Models 50, 60, and 50Z) fall into one of these three categories.

Don't be misled into thinking it's just the socket compatibility that dictates whether you can use an SX upgrade card. All five vendors in this review indicate compatibility with specific brand names and models (primarily with IBM, but also the Compaq Deskpro 286).

If you own a clone, however, you might be in luck. Microway, for example, has a three-page list of compatible machines outside of the ones the company guarantees. That list indicates what problems, if any, Microway found with them. Microway's list, like the information collected by the other vendors we covered, is based on the testing the manufacturer does, and it grows on a weekly basis. Nonetheless, you should have a long talk with your prospective vendor to explore what other options you have if an upgrade module doesn't work in your computer.

REVIEW CRITERIA

We stayed with the PGA upgrades that fit either the Micro Channel-based IBM PS/2 Model 60 or the ISA-based IBM PC

Overall, these SX upgrade boards are no more than a stopgap approach to keep you from trashing your 80286. Don't count on being state-of-the-art.

AT to simplify testing and to offer the largest number of comparisons in any group. We also selected the 20-MHz version of the card where there was a choice. In the case of Microway, which has one version of its FASTCache card that accepts RAM and one that cannot, we tested both and found no difference in performance. Cumulus is a special case in that the company does not market its board as an accelerator card. Rather, Cumulus positions its 386SX Card as a means of running 386 software in what is still effectively an unenhanced 286 environment. Intel was the only company whose prod-

uct was available only for the Model 60.

Overall, these SX upgrade boards are no more than a stopgap approach to keep you from trashing your 80286. Whether or not you have kept pace with technology and already upgraded your video and hard disk subsystems, you'll be slightly better off than you were. Just don't count on being state-of-the-art.

AOX INC. StaX SX

Aox has managed to squeeze quite a bit of performance from its little module, although like most upgrade cards, the StaX SX cannot push your system all the way up to true 20-MHz levels. When we tested it on an 8-MHz IBM PC AT, however, it yielded some fairly decent speeds, approaching the 16-MHz mark on our 80386 Instruction Mix test.

The StaX SX module looks like a small circuit-board sandwich garnished with a large-scale integrated-circuit chip on top. Somewhere inside lurks an 80386SX processor that runs at either 20 MHz (the \$329 version) or 16 MHz (\$279). In either version, you'll find 4K of processor RAM cache. The proprietary chip that sits on top manages the cache.

The Aox StaX SX works with a wide variety of systems, coaxing forth roughly twice as much speed as you'd get from a 286. It is available in both PGA or PLCC

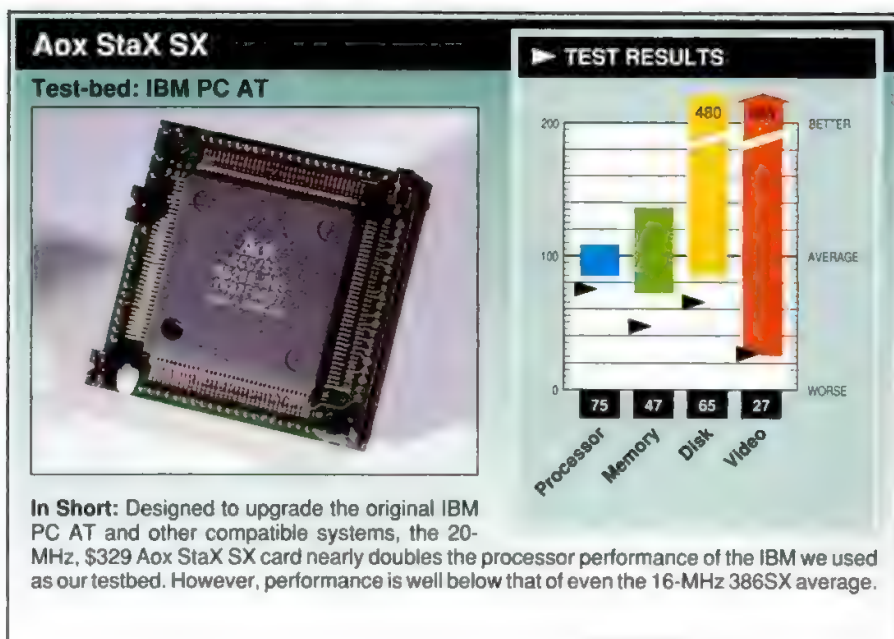
versions to accommodate whichever processor socket type your system contains. To date, Aox says the module can be used with AT-style machines from AST, Compaq, Epson, Everex, Hewlett-Packard, IBM, NCR, NEC, PC Craft, Sperry, and Tandon.

Both the Aox and the Microway boards require ROM BIOS replacement. Aox included the BIOS ROMs at no charge with the PGA module it sent for review. Aox mandates replacement for any BIOS dated prior to May 1985 in a 6-MHz AT or 11/11/85 in an 8-MHz AT.

The new ROMs settle a potential boot-up timing problem, add a wider selection of hard disks, give you 3.5-inch disk compatibility, and take away cassette BASIC. With both boards, however, this last item costs you BASICA, which will no longer function without the cassette BASIC routines. The solution is to find yourself a copy of GW-BASIC if it's that important to you.

The StaX SX lacks an 80387SX coprocessor socket. But since the card itself is not much larger than the processor chip it's replacing, there wouldn't be room. Instead, the module is designed to work with an 80287 through the proprietary chip that also manages the cache. If your system is already equipped with an 80287, you won't have wasted your investment.

Of the two boards tested in an IBM PC AT—Aox's StaX SX and Microway's FASTCache—the StaX SX came in second, but not by much. The widest difference between the two occurred on the



Important information for You!

ZEOS just announced an unbelievably great deal!
For a limited time only, buy any new ZEOS Windows
system and you'll also receive Lotus 1-2-3 for
Windows PLUS Lotus' new Windows word processor Ami
Pro 2.0--AT NO EXTRA CHARGE! The best software
AND the best hardware! CALL ZEOS NOW: 800-423-5891



BENCHMARK TESTS: SX UPGRADES FOR 286-BASED COMPUTERS

None of these 20-MHz upgrade cards came close to granting real 20-MHz SX processor performance to either of our baseline machines. In all cases, the average increase moved the computers closer to 16-MHz processor levels.

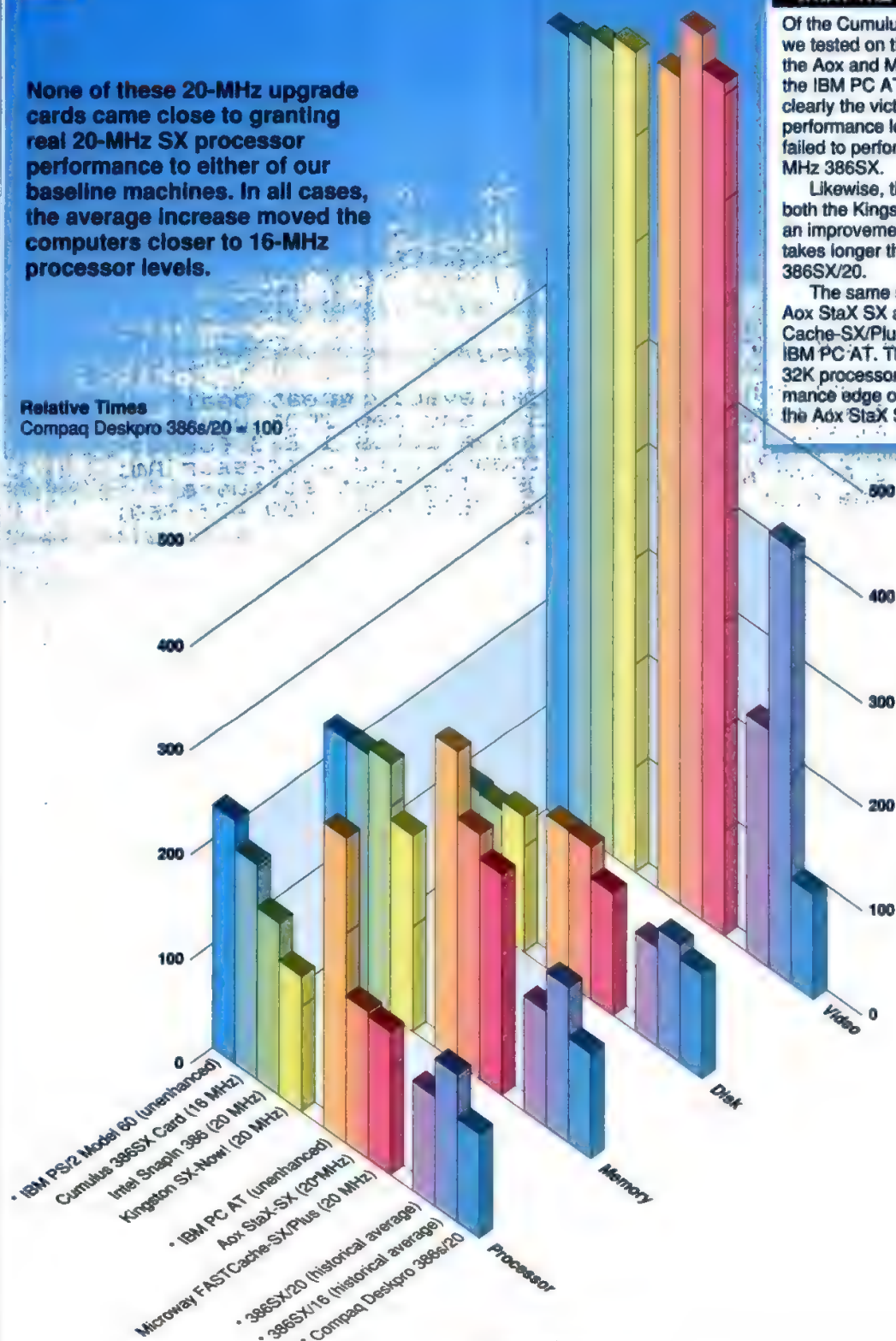
Relative Times
Compaq Deskpro 386s/20 = 100

WHAT THE NUMBERS MEAN

Of the Cumulus, Intel, and Kingston cards we tested on the IBM PS/2 Model 60, and the Aox and Microway cards we tested on the IBM PC AT, the Kingston SX-Now! was clearly the victor in terms of processor performance levels, though even that card failed to perform as well as the average 20-MHz 386SX.

Likewise, the processor RAM cache on both the Kingston and Intel boards provides an improvement over the Model 60 but still takes longer than the average for the 386SX/20.

The same situation holds true for the Aox StaX SX and the Microway FAST-Cache-SX/Plus, which we tested on the IBM PC AT. The MicroWay FASTCache's 32K processor RAM cache gave it a performance edge over the smaller 4K cache on the Aox StaX SX. The Cumulus 386SX



Shorter bars represent better performance.

* Reported for comparison.

Card trails the other boards tested on the PS/2 Model 60, but it contains no cache and was not designed to be an accelerator card. Instead, it is a means of running 80386 software in an 80286 environment.

The video test results are reported for comparison only. Current VGA technology—which includes the speed advantage offered by video BIOS shadowing, as well as enhanced color and resolution—is far more desirable than the slower EGA technology found in the original 80286 computers.

PC Magazine Labs' disk benchmark test results each represent the cumulative total of 16 individual tests. Minor differences in the benchmark test results among upgrade boards tested in the IBM PS/2 Model 60 reflect the cumulative differences within the margin of error allowed by the tests. On the IBM PC AT, the significant differences in the test results between Microway and Aox (as well as the unenhanced AT) were probably the result of cumulative performance gains achieved during the file create and sequential read operations in the small-record segment of the disk test (512 records by 512 bytes). The small size of the operations may have been affected by the Microway card's 32K processor RAM cache.

■ The **Instruction Mix** benchmark test times a series of tasks specific to the processor. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower times can indicate the presence of memory wait states or memory chips rated at relatively slow access speeds.

HOW WE TESTED

In testing these five 386SX upgrade cards, we used a 10-MHz IBM PS/2 Model 60 and an 8-MHz IBM PC AT as our test-bed and ran PC Magazine Labs' Hardware Performance Tests, Release 5.6. We used the cards in whichever of the two systems the manufacturer specified: the Model 60 for the Cumulus, Intel, and Kingston cards, the PC AT for the Aox and Microway cards.

The computers' buffers were left at their default values. We used no software disk caches when performing disk benchmark tests and no RAM-resident programs were loaded for any of the tests. The only drivers loaded were those needed to run the cards.

■ The disk score is the sum of the small-record and large-record DOS File Access benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

■ The **Direct to Screen** benchmark test indicates the speed of the video adapter memory. A good score indicates that information can get to the screen quickly, particularly when programs bypass the computer's video BIOS.

Lower scores represent better performance.	Processor (seconds)	Memory (seconds)	Disk (seconds)	Video (seconds)
* IBM PS/2 Model 60 (unenhanced)	7.23	1.10	81.16	6.59
Cumulus 386SX Card (16 MHz)	6.38	1.10	80.95	6.65
Intel Snapin 386 (20 MHz)	5.12	1.13	79.41	6.75
Kingston SX-Now! (20 MHz)	4.01	0.88	85.09	6.87
* IBM PC AT (unenhanced)	9.06	1.40	96.25	6.92
Aox StaX-SX (20 MHz)	4.37	1.10	95.79	7.41
Microway FASTCache-SX/Plus (20 MHz)	4.24	0.99	76.51	7.14
*386SX/20 (historical average)	3.26	0.52	62.28	2.01
*386SX/16 (historical average)	4.38	0.70	74.45	3.66
* Compaq Deskpro 386a/20	3.11	0.47	65.73	0.88

* Reported for comparison.

Floating-Point Calculation test (not shown on our benchmark test charts), for which the StaX SX's 4K of cache RAM was just barely sufficient. Even so, results for the Aox card were surprisingly good; it completed the test in little more than half the time the unenhanced PC AT required.

Although both cards finished the 80286 Instruction Mix test in about half of the unenhanced PC AT's time, neither brought the AT up to speed on the 80386 Instruction Mix test—if by speed you mean the equivalent of true 20-MHz times on a 386SX. Instead, the 4-minute-37-second time scored by the Aox almost exactly matched the 4-minute-38-second time scored by the average 16-MHz 386SX. On the same test, the Aox took more than a tenth of a second longer than either the 20-MHz 386SX or the Microway card.

Aox's installation manual is somewhat brief, although like the module itself, it manages to pack everything you need between the front and back. The company's parts-and-labor warranty is for one year only, so this module may not be the best long-term solution you can find. It is, however, the least expensive alternative that actually speeds up your computer.

StaX SX

Aox Inc., 486 Totten Pond Rd., Waltham, MA 02154; 800-726-0269.

Price: 16-MHz, \$279; 20-MHz, \$329.

Compatibility: AST (Bravo, Premium), Compaq Deskpro 286, Epson Equity III, Everex Tempo, HP Vectra, IBM (PC AT, P/S 2 Model 30/286), NCR PC 810, NEC APCIV, PC Craft 286, Sperry/IT, Tandon Plus.

CIRCLE 419 ON READER SERVICE CARD

CUMULUS CORP. Cumulus 386SX Card

Speed is nice, but what if all you want is to run 386 software on your unadorned 286? The Cumulus 386SX Card gives you that opportunity.

If you equate performance solely with speed, don't look for it here. The 386SX Card has no processor RAM cache. Cumulus Corp. designed it to yield a conservative speed increase that averages about 10 percent over 286 processing speed. But consider what else you get.

For \$299—a price that veers toward the low end of the range for the board alone—Cumulus bundles a full-fledged

Networking.



Without fresh information

Some say "the network is the system," but we say your network is your *business*. In fact, without a good network you could be out of business.

Unfortunately, for too many companies, networking is not working. Or, not well enough.

Often it's because computer systems once chosen to solve problems are now causing them, because they can't communicate.

To pull things together takes a broad perspective, plus real knowledge of enterprise systems. Which makes IBM an ideal networking partner, especially since we're not just committed to open, multivendor environments, we're delivering.

For example, we're now helping UCLA build a



flowing freely, companies wither and die.

campus-wide network that will connect 15,000 people using Apple®, DEC® and IBM systems, tied together by TCP/IP and SNA protocols.

We're also a leader in OSI, with OSI offerings across all IBM platforms. And our SNA networks are open to a wide variety of non-IBM systems.

What's more, IBM's network management systems are the industry's most robust, which is why Santa Fe Railway is using IBM NetView® for automating operations and to control not just their LANs but costs as well.

You can also tie into the IBM Information Network for worldwide communications with customers and suppliers. And you can use voice-

enhanced solutions like IBM CallPath™ to greatly improve customer service.

But technology aside, the point is to get information flowing more freely around your company. And it's no longer just a good idea, it's an absolute business imperative.

Networking shouldn't be done piecemeal; you have to consider all the pieces at once—no matter who made them—and IBM has the resources for helping you do that.

To learn more about IBM networking, talk with your IBM marketing rep. Or to have one call you, call us at 1 800 IBM-6676, ext. 880. **IBM®**

version of *Microsoft Windows 3.0* with its 386SX Card. The combination is intended primarily as a software solution for 386 applications and automatically gives you compatibility with an 80387SX. Cumulus even includes an LIM

4.0-compatible expanded memory manager, as well as driver software for the board.

Cumulus does not, however, supply

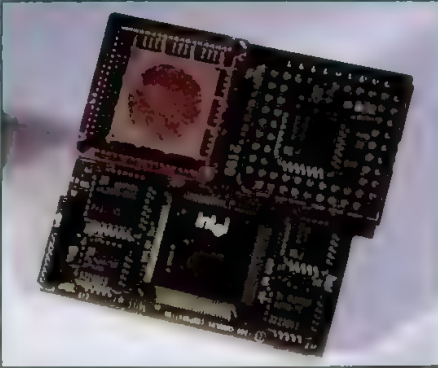
upgrade BIOS ROMs with the card. This may limit its usefulness on your AT if you also plan to upgrade your hard disk system or use 3.5-inch floppy disk drives, which the older BIOSes cannot address. Since BIOS manufacturers do not sell directly to end users, finding an upgraded ROM BIOS on your own may be difficult or impossible.

The Cumulus 386SX Card comes in different versions whose model numbers—11, 12, 13, and 15—reflect compatibility with different computers. It is designed to work with the IBM PC AT, the Compaq Deskpro 286, and a number of computers in the IBM PS/2 line (Models 30/286, 50, 60, and 50Z). We selected the Model 11, which has a PGA socket and is compatible with the IBM PC AT and the PS/2 Model 50/60.

The physical installation of the board is very straightforward, thanks to a profusely illustrated manual. After you remove the original processor from your computer, you need to set a jumper on the 386SX card to make it conform to the type of computer in which it is installed. The manual contains line drawings that show not only the location of the original 80286

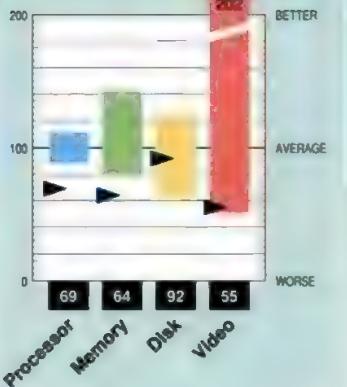
Cumulus 386SX Card

Test-bed: IBM PS/2 Model 60

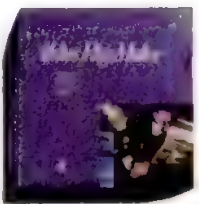


In Short: The Cumulus 386SX Card offers 386 hardware compatibility for software; it's not designed as an accelerator card. Even so, it manages to increase the IBM PS/2's performance by just under 10 percent. At \$299, bundled with *Windows 3.0*, this card can be a good bargain if you don't mind the large trade-off in speed.

TEST RESULTS



You could be a genius and do this on a word processor.



Layout and design software for the PC and Macintosh.

It'll take more than brains to create this on your word processor. It'll take some old-fashioned cutting and pasting. And it won't look nearly as good.

On the other hand, you could do the smart thing and create it on Aldus PageMaker® 4.0 for Windows. In the process, you'll save yourself a

great deal of frustration, and plenty of your precious time.

You see, PageMaker has many capabilities not found in a word processor. All of which makes creating reports, proposals, brochures, catalogs, or manuals quick and easy. Not to mention eye-catching.

12 ZOLTA LIGHTING 1992/93 Sales Forecast

REVENUE FORECAST

Consumer recovery means the nation will lead to greater revenues for Zolta Lighting. We see a surge in ultra expansion and rebuilding from many companies that have delayed investments, waiting for better economic signals.

Revenues for 1992 will grow on estimated 20% over 1991. They will grow an additional 12% for 1993. This will bring the total year revenue improvement to a growing 32% over the two-year period. (See chart.)

The total increase in the number of units shipped and as improvement in profit margins are the primary reasons for the growth in revenues.



SALES ARE BEGINNING TO LIGHT UP. The steady, yet slow, healing of the nation's economy is giving us greater hope for accelerated sales in the coming two years. Already we are seeing positive signs with growth in nearly all of our product lines: commercial, domestic and industrial applications as well as our custom designer series.

Add to the growing economy our reputation for leading-edge designs and top-quality products. We believe this combination gives us an enviable position to capitalize on the regrowth of business. In addition, we are maintaining a strong and solid sales force and state-of-the-art manufacturing facilities—eliminating lost time and money typically required to refurbish plants and train personnel.

PROJECTED SHIPMENTS	1992	1993
1st Quarter	25,000	33,000
2nd Quarter	30,000	38,000
3rd Quarter	35,000	43,000
4th Quarter	40,000	47,000

In this state of "ready" we feel confident in projecting the above gross company shipments. (See chart.)

1992 shipments will give us a 20% sales increase over 1991. 1993 sales should increase an additional 12% over 1992, giving us a healthy 32% upswing over a two-year period. (See chart at left.)

COMPUTERS SX TRANSPLANTS

processor on a variety of motherboards but also the correct jumper settings for each one.

Cumulus warrants the card for one year on parts and labor and guarantees compatibility with the computers it lists by name—all of which are either IBM or Compaq. Although running the card in any of the machines that Cumulus claims is compatible is no guarantee that the upgrade card will work, Cumulus will give you a full refund if you find that it doesn't.

While an upgrade to a 386SX is likely to appeal mightily to potential *Windows* users, Cumulus is the only company to bundle *Windows* with its card. If you are looking for software compatibility and not speed, things just don't get any better (or less expensive) than this.

Cumulus 386SX Card

Cumulus Corp., 23500 Mercantile Rd., Cleveland, OH 44122; 216-464-2211.

Price: \$299 (includes *Microsoft Windows 3.0*).

Compatibility: Compaq Deskpro 286, IBM (PC AT, PS/2 Models 30/286, 50, 60, 50Z).

CIRCLE 420 ON READER SERVICE CARD

INTEL CORP. SnapIn 386

Intel Corp.'s \$495 SnapIn 386 board does just one thing, but does it very well: The board is designed to work solely with the IBM PS/2 Model 50 or 60.

How well does it work? Intel claims the SnapIn 386 can increase overall performance (though not necessarily processor speed) by about 1.7 to 2 times; results on the PC Magazine Labs tests confirm this claim. While the SnapIn 386 was not the fastest of the three boards tested on the Model 60, it wasn't far off the mark, either, reducing the PS/2 Model 60's 80286 Instruction Mix time by 30 percent. On the Floating-Point Calculation test, the SnapIn 386's 16K RAM cache helped it to cut the PS/2's test time in half.

Missing from the card is an 80387SX coprocessor socket; the presence of Intel's proprietary Application-Specific Integrated Circuit (ASIC) is the reason. This custom-designed large-scale integrated circuit contains the cache support

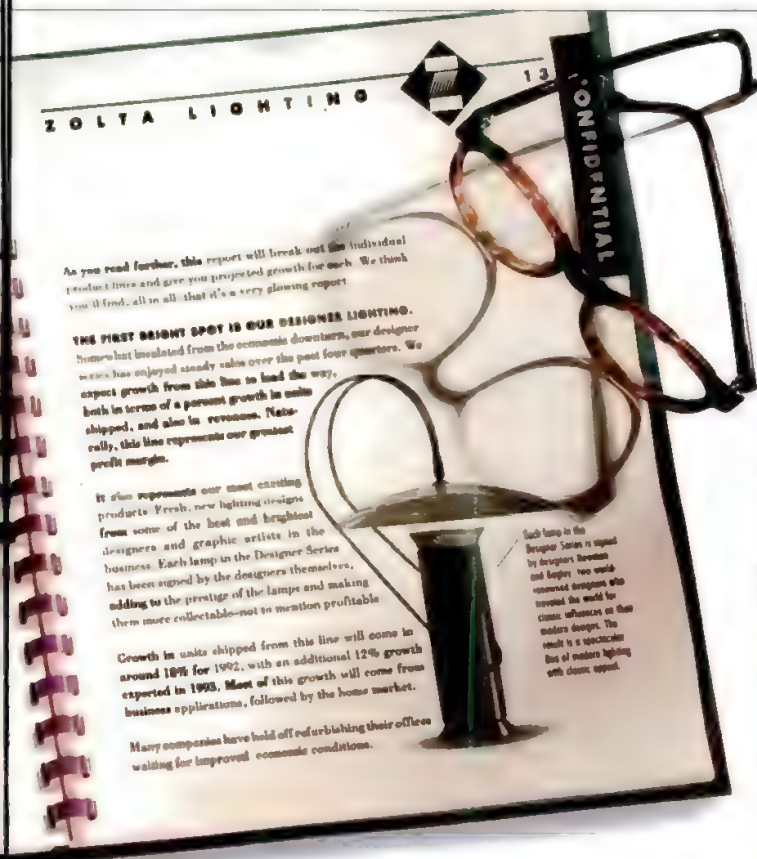
logic and also interfaces with an 80287 math coprocessor. If you already have a 287, you're ahead.

Intel thoughtfully includes both a chip removal tool and a comprehensive manual to guide you through the SnapIn 386's installation. Intel's manual is the only one among all the cards reviewed here that mentions the possibility of damaging the processor's socket (and consequently your motherboard) if you misalign the removal tool. Installation of the software driver is handled automatically through a setup utility.

UNPARALLELED SUPPORT

Intel offers a comprehensive warranty that guarantees parts and labor for a full three years. Its support facilities are unparalleled and include a direct (though not toll-free) phone line for technical support, a bulletin board service, and access to technical personnel through MCI or CompuServe.

Intel's 20-MHz SnapIn comes in a PGA socket type. Actually, it is a close cousin of the 16-MHz In-Board 386/PC, which Intel designed as an 80386DX upgrade for 8088-based computers.



Or use PageMaker for Windows and just look like one.

Special features pull together multiple files of text, graphics, spreadsheets, tables, or databases. PageMaker's precision layout and typographic tools then effortlessly give them a professional polish. In fact, to quote the March 1991 issue of *PC Computing* "PageMaker 4.0 proves you don't have to sacrifice ease of use for sophisticated, professional page-makeup abilities."

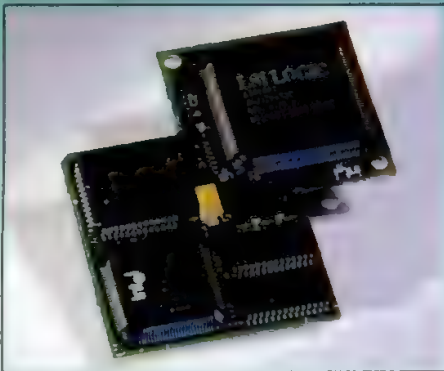
To find out more about the benefits of desktop publishing, call 1-800-685-3512 for a free booklet. Then get ready to show everyone your true brilliance.



The Creative Edge
in Business.

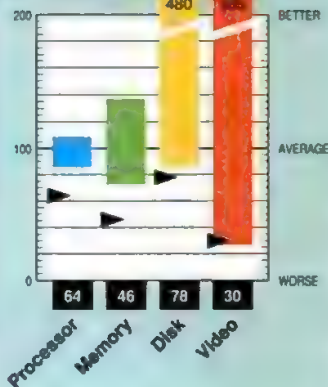
Intel SnapIn 386

Test-bed: IBM PS/2 Model 60



In Short: With a plethora of support available, including a bulletin board and fax-back information service, the \$495 SnapIn 386 is one of the most affordable and sensible ways to turn the IBM PS/2 Model 60 into a 386SX. The board is not the fastest, but it misses the mark by only a small amount. The card is also designed for that model only.

TEST RESULTS



The only drawback of the SnapIn is that it works exclusively with the PS/2 Models 50 and 60, and that's not a drawback if you own one. With Intel's extensive support and service—and dealer discounts to make the price less formidable—the SnapIn would be a corporate buyer's dream.

SnapIn 386

Intel Corp., 5200 N.E. Elam Young Pkwy., Hillsboro, OR 97124; 800-538-3373.

Price: 20-MHz, \$495.

Compatibility: IBM (PS/2 Models 50, 60).

CIRCLE 421 ON READER SERVICE CARD

the only possible explanation is that there is no memory-resident TSR or driver to intercept the code.

Since the SX Now! comes in 16- and 20-MHz versions, four versions of the card—all PGA-based—are available. The 16-MHz version is \$445, but better by far is the 20-MHz card, which gives you an extra 4 MHz for only \$40 more.

From the top side, the SX-Now! 50-60 looks hardly capable of much at all: Only the Intel 386SX, a socket for an 80387SX, and an Austek cache controller are vis-

ible. The Austek chip, however, clues you to look for something more. Indeed, on the reverse side of the board, you'll find the 16K of RAM cache that the Austek chip controls, along with a few other logic devices.

GOOD MANUAL

Kingston's manual includes a full complement of photographs to ease you through the installation—a job it does quite well. There is only one software utility, which enables or disables the cache and does not remain in memory when it's done.

Kingston prefers to have its local dealers handle service and support. To that end, it hopes to make your association with the vendor a long-lasting one: Kingston guarantees the SX-Now! board for five years on parts and labor. Considering how long your computer has been in service, it's likely that the motherboard will give up the ghost before the SX-Now! does.

Since Kingston sells only through its dealers, you can anticipate some dealer discounts on the SX-Now! board. That factor alone would make the board a bargain.

SX-Now!

Kingston Technology Corp., 17600 Newhope St., Fountain Valley, CA 92708; 714-435-2600.

Price: 16-MHz, \$445; 20-MHz, \$495.

Compatibility: IBM (PS/2 Models 50, 60, 50Z).

CIRCLE 422 ON READER SERVICE CARD

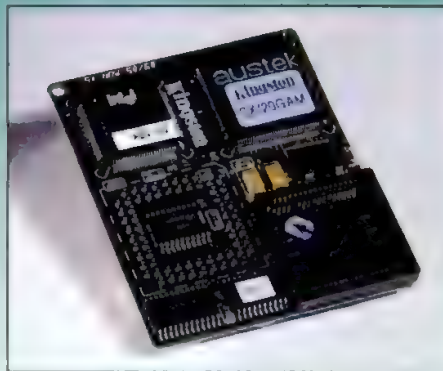
KINGSTON TECHNOLOGY CORP. SX-Now!

Kingston Technology Corp.'s SX-Now! is the undisputed performance champ of the boards that were tested on the IBM PS/2 Model 60. The SX-Now! came in marginally faster than Intel's SnapIn 386 board and considerably faster than the Cumulus 386SX Card on PC Magazine Labs' Instruction Mix and Conventional Memory tests.

The board's performance advantage on the Conventional Memory test, however, is not totally explicable. We assume that the caching action of the SX-Now! has extended to the memory test. If it has,

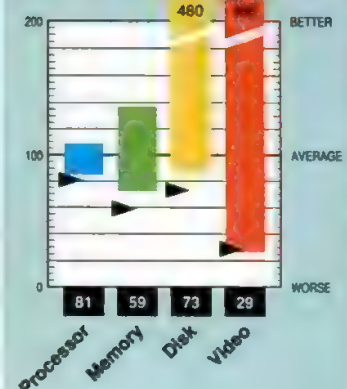
Kingston SX-Now!

Test-bed: IBM PS/2 Model 60



In Short: The fastest of the three boards tested on the PS/2 Model 60, the Kingston SX-Now! is moderately priced at \$495 for a 20-MHz module and carries a fine five-year warranty. It's limited to upgrading the IBM Models 50, 50Z, and 60 but comes closest of any of the cards in this review to giving true 20MHz 386SX performance.

TEST RESULTS



PC
MAGAZINE

FIRST LOOKS

IBM's Model 90:
PS/2s Go the Next
Round with 486 Power
And XGA Graphics

SOFTWARE

Now You C; > It.

PCs
5 M
You
Or J

Mor
PC
33-M

BE
19

7th Annual
Technical E

The Year's
Editors' Pe

Gaffe Plot:
the Year's



At 9ms, THIS SHOULD BE ON THE COVER.

Stop the presses, call the editor. Now you can get more speed, more room, more power, more of everything. Except price.

Presenting Hardcard II XL™ A hard drive with 9ms effective access time¹ designed for 286/386 systems.

Now here's the news. *The New York Times* says Hardcard II XL offers "more speed than regular drives for a comparable price."

And the numbers confirm this. Hardcard II XL runs up to 9 times faster than a typical 28ms drive, thanks to a staggering 14 MB per second sustained transfer rate.² With 50 or 105 MB capacity, you have enough room to run Windows™ 3.0.

There's also a two year warranty and a level of service and reliability our customers (and PC Magazine*) tend to brag about.

All this for about the same price as the typical 28ms drive.

Nice cover.

For your nearest dealer, call 1 800 624-5545.

Plus
A Quantum Company

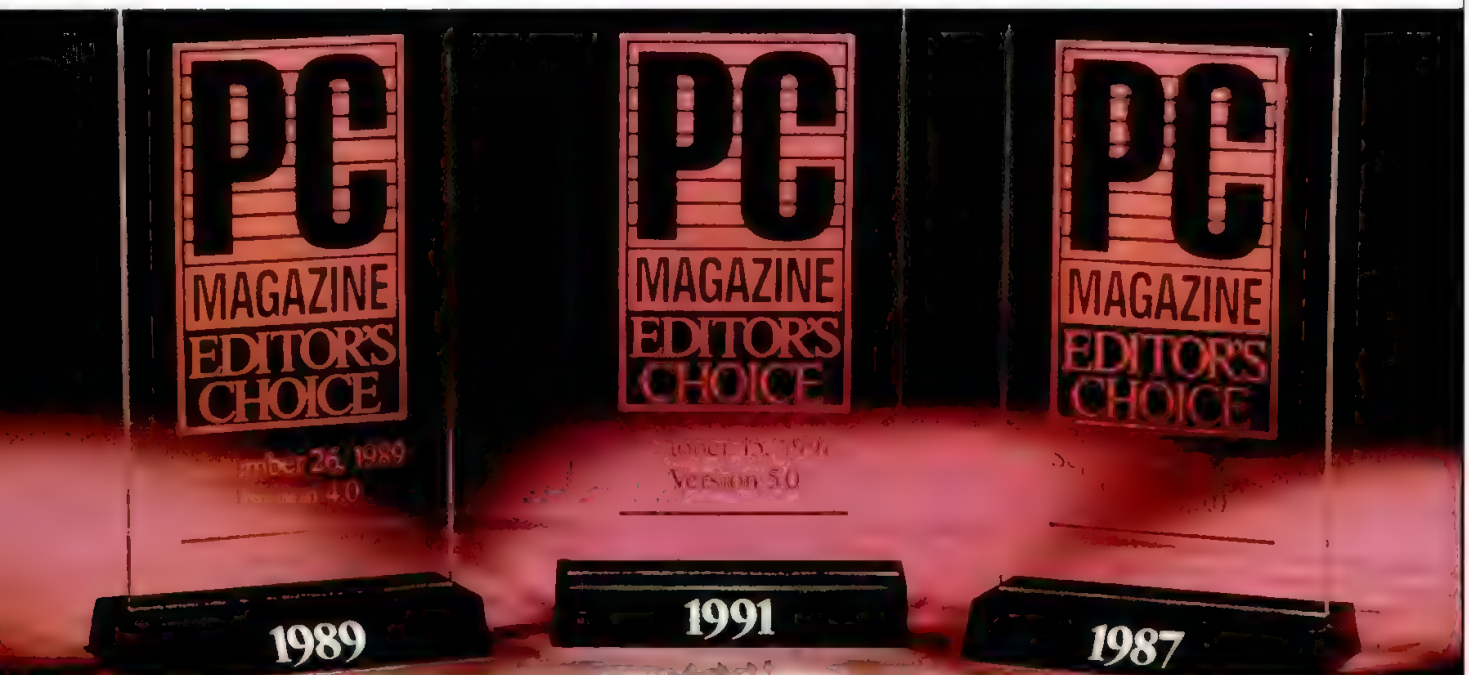
THE 9ms ERA

XL

HARDCARD II XL

*PC Magazine service and reliability survey ranked Plus Development #1 September 25, 1990.
CIRCLE 147 ON READER SERVICE CARD

A lot has changed in Accounting Software in 5 years.



Fortunately for you, a few things haven't.

Like our commitment to research.
Innovation. And leadership.

In an industry that changes faster than
any other, only one accounting
software has remained at the forefront
of business management technology.
Macola.

And here's the proof. Only Macola has
won *PC Magazine's* prestigious
Editor's Choice award an unprec-
edented three times in a row.

What does this mean to you? Software
that's fast and easy-to-use. LAN per-
formance with no limitations. The
most customization options to best fit
your company. Local support. More
integrated add-on products. Powerful
software that exceeds your current
financial and information manage-
ment requirements.

In short, accounting software you'll
never outgrow.

CIRCLE 263 ON READER SERVICE CARD

Call us today, toll-free, for more
information.

1-800-468-0834

MACOLA[®]
SOFTWARE

333 East Center Street
Marion, Ohio 43302-4148

**Accounting Software
You'll Never Outgrow.**

COMPUTERS
SX TRANSPLANTS

MICROWAY INC.
FASTCache-SX
FASTCache-
SX/Plus

With Microway's coprocessor, RAM, and other options, the FASTCache-SX upgrade boards are among the most versatile cards on the market. And though their performance more closely rivals that of 16-MHz 386SXs, they are compatible with a wider variety of systems than any other.

Both Plus (\$595) and standard (\$495) versions are 20-MHz ISA upgrades. Both have a processor RAM cache expandable from 32K to 64K and a socket for an 80387SX. The Plus version, however, gives you eight SIMM sockets, which you can fill with up to 8MB of RAM. For either card, you will need a cable (\$95) to connect it to the PGA, PLCC, or LCC processor socket in your system.

If you are installing either card in an IBM PC AT, you will also need a new pair of ROMs (\$50). As with the Aox board, these replace the current system ROMs to prevent a timing problem that would occur with the originals. The new ROMs let you install a wider selection of hard disks or a 3.5-inch drive. You lose cassette BASIC in the exchange, however, which in turn costs you the ROM-based BASIC routines that BASICA requires.

The performance advantage of the

Microway cards is apparent from the Instruction Mix and Conventional Memory benchmark tests. The Plus version of the card had no real effect on the memory times because most of the installed RAM is relegated to extended memory; only 128K backfills conventional memory. The advantage conferred by the larger cache,

however, roughly cut in half the Stax SX's performance time on the Floating-Point Calculation test.

If you're not feeling confident enough to remove the processor chip, plug in a ribbon cable, and then insert a board into a slot; there's even a low-cost on-site installation package from TRW that starts at \$40. Microway gives you 30 days to return the board, and the company warrants it for five years.

The Microway solution is a bit pricey if you consider all of the possible add-ons, including memory. It's also the most complete solution available for an IBM AT, and worth a serious look.

FASTCache-SX
FASTCache-SX/Plus

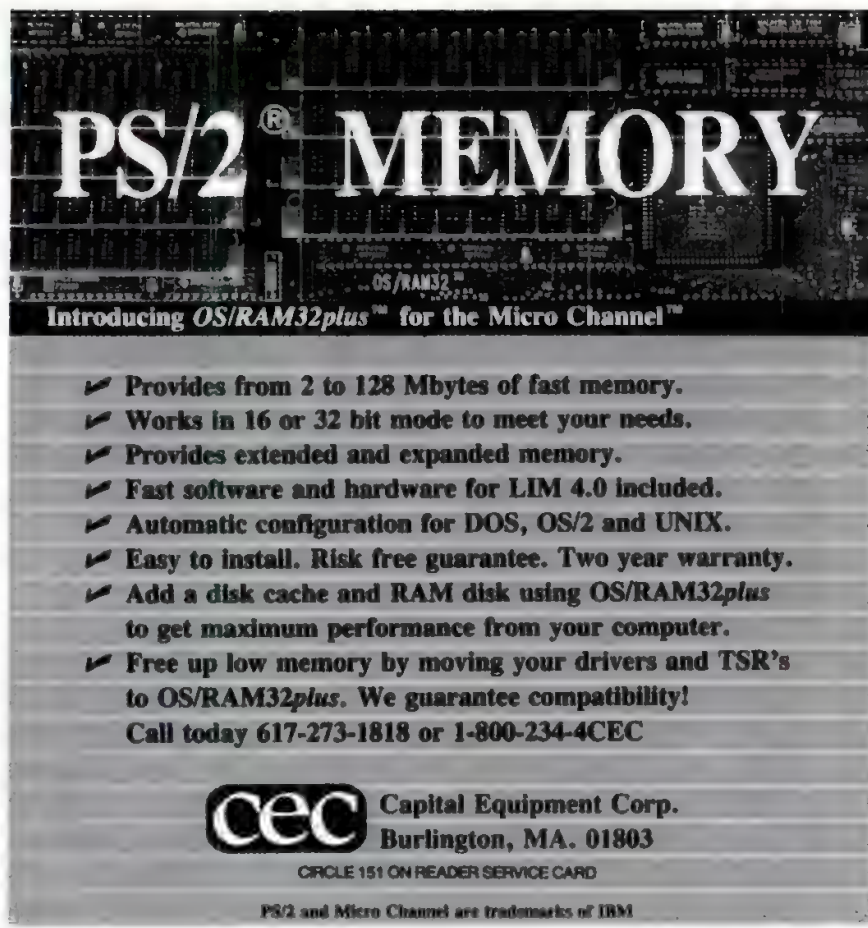
Microway Inc., Research Park, Box 79, Kingston, MA 02364; 508-746-7341.

Price: 20-MHz FASTCache-SX, \$495; 20-MHz FASTCache-SX/Plus, \$595 (includes no RAM, expandable to 8MB).

Compatibility: Compaq (Deskpro 286, Portable II); IBM (PC AT, XT-286, PS/2 Model 30/286); 61 other models.

CIRCLE 423 ON READER SERVICE CARD

Bill O'Brien is a contributing editor of PC Magazine.



PS/2[®] MEMORY

Introducing OS/RAM32plus[™] for the Micro Channel[™]

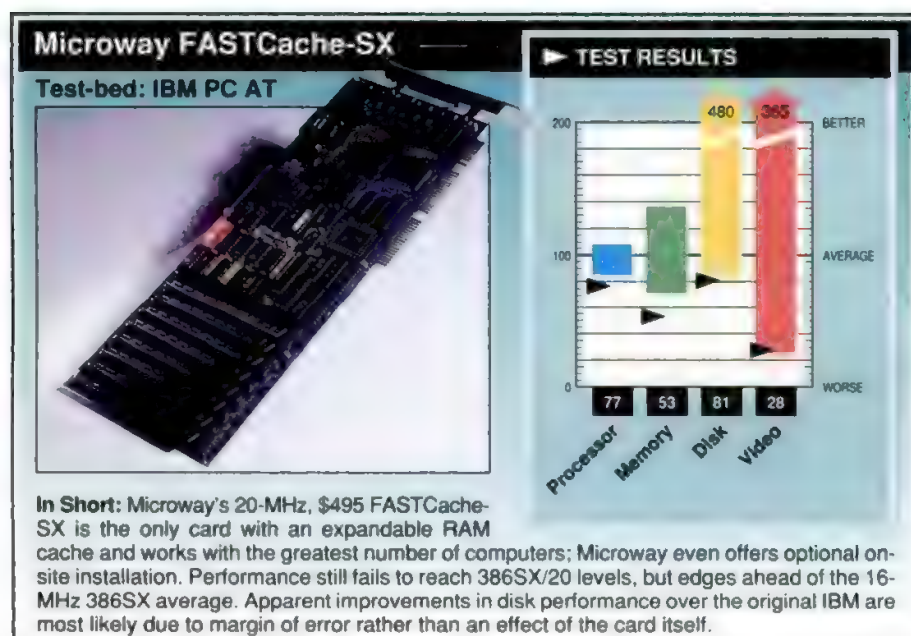
- ✓ Provides from 2 to 128 Mbytes of fast memory.
- ✓ Works in 16 or 32 bit mode to meet your needs.
- ✓ Provides extended and expanded memory.
- ✓ Fast software and hardware for LIM 4.0 included.
- ✓ Automatic configuration for DOS, OS/2 and UNIX.
- ✓ Easy to install. Risk free guarantee. Two year warranty.
- ✓ Add a disk cache and RAM disk using OS/RAM32plus to get maximum performance from your computer.
- ✓ Free up low memory by moving your drivers and TSR's to OS/RAM32plus. We guarantee compatibility!

Call today 617-273-1818 or 1-800-234-4CEC

cec Capital Equipment Corp.
Burlington, MA. 01803

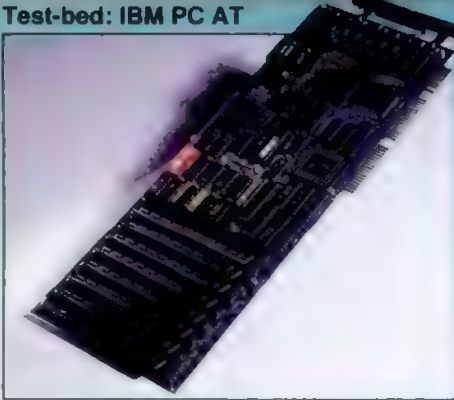
CIRCLE 151 ON READER SERVICE CARD

PS/2 and Micro Channel are trademarks of IBM



Microway FASTCache-SX

Test-bed: IBM PC AT



TEST RESULTS

Category	Value
Processor	77
Memory	53
Disk	81
Video	28

200
100
0

BETTER
AVERAGE
WORSE

480
385

In Short: Microway's 20-MHz, \$495 FASTCache-SX is the only card with an expandable RAM cache and works with the greatest number of computers; Microway even offers optional on-site installation. Performance still fails to reach 386SX/20 levels, but edges ahead of the 16-MHz 386SX average. Apparent improvements in disk performance over the original IBM are most likely due to margin of error rather than an effect of the card itself.

SEVEN POWERFUL SOLUTIONS.



ONE COMMON DENOMINATOR.

Uncommon "flexibility" is the common denominator of Copam's upgradable B Series personal computers. Seven powerful solutions protect your PC investment and allow you to upgrade to higher performance when you need it. Start out with an affordable 386SX, then upgrade within minutes without changing out the system, disk drives and add-in cards or unplugging devices. Our B Series includes the 386SX, 386DX and 486 platforms and provides you with an upgrade path to the 586 platform when it is available.

Copam has a proven reputation in over



40 countries worldwide for providing customers with a continued commitment to advanced technology. Our PC products include our slim M Series, which utilizes an integrated motherboard for disk controllers, video adapters and ports, our upgradable B Series, and our high performance V Series which includes EISA network file server products. We manufacture a complete line of monitors and PCs and pioneered the development of the first affordable Low Radiation systems. Our level of commitment includes nationwide on-site service and technical support and is reflected in our customer satisfaction levels...worldwide.



B Series

M Series

V Series

So, calculate your best solution to success by adding up the advantages Copam offers you. Call us today, TOLL-FREE at 1-800-828-4200 for the Copam dealer nearest you and get the right common denominator working for you!

See us at Comdex, Booth #H7358

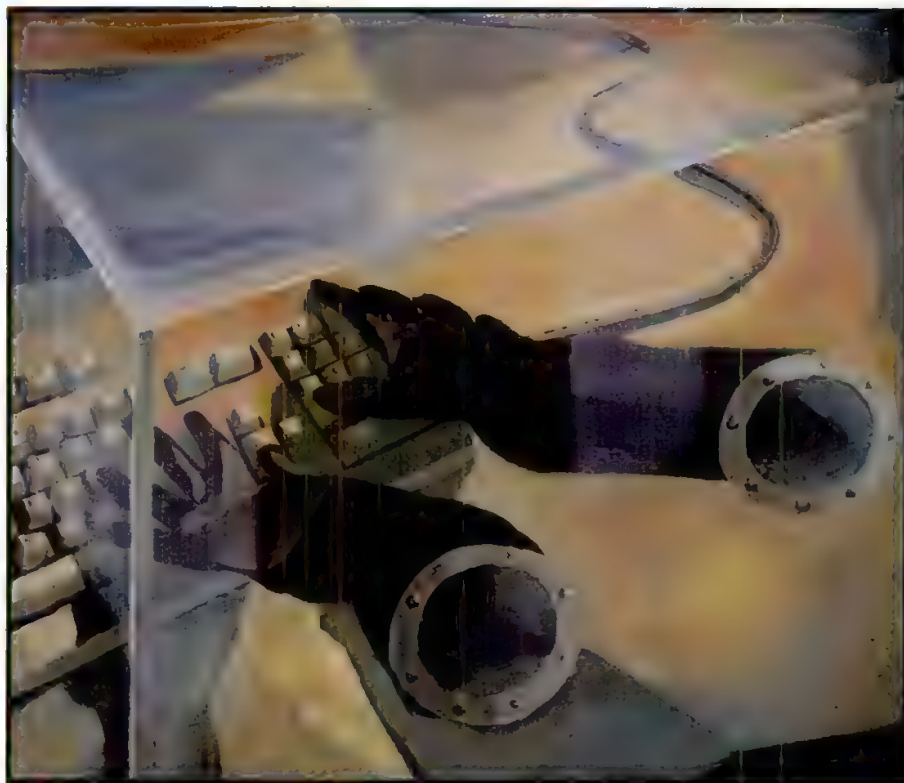
Copam name and logo are trademarks of Copam, Inc.
The Intel Inside logo is a trademark of Intel Corporation.
©1991, Copam, Inc.

COPAM[®]

45875 Northport Loop East, Fremont, CA 94538 (510) 623-8911 Fax: (510) 623-8551

CIRCLE 372 ON READER SERVICE CARD

Is there any surefire way to protect your PC from virus attacks? PC Labs pits 20 antivirus utilities against 6 prevalent viruses to find out which programs take the best precautions.



ON GUARD:

20 Utilities That Battle the Virus Threat

Isn't it odd how small strings of computer code can stir the imagination once you group them together and call them viruses? Encountering a virus as you work with your PC is a threat in the same way that getting into an automobile accident is a threat. Although driving carefully will minimize your risk, you should wear a seatbelt just to ensure safety.

In this evaluation, we test 20 antivirus software solutions. Some programs merely detect changes to files on a PC; others go

by Carol Ellison

farther to identify viruses, remove them, and repair the damage they cause. PC Magazine Labs used 6 viruses in testing, and commissioned a seventh, the Totally Hidden Virus, which was specially designed not to be caught. In most cases it wasn't, and PC Labs is giving the virus code to all the vendors whose products are evaluated here so they can analyze its characteristics.

THE ONCE AND FUTURE VIRUS

Computer viruses are the work of man, not nature. The first known virus was written in 1983 by Fred Cohen, a student at the University of Southern California who set out to prove computer code could replicate itself, attach to other files, and change the behavior of the computer containing the files. He succeeded and presented his findings at a seminar on computer security and later in a doctoral dissertation.

That first virus was no prototype. It proved only that tiny strings of program code, which are rarely larger than 4K at birth, could grow in geometric proportions once they were planted on a hard

disk, and that the behavioral changes they wrought in their host could make the computer system downright suicidal.

Viruses have evolved over time, and at least part of the evolution is due to the emergence of antivirus products such as the ones reviewed here. For every company that claims its antivirus software product can detect and protect against all known and unknown viruses now and into the future, there's a virus writer bent on proving the company wrong.

Few virus programmers step forward to declare their motives, but the newest and most virulent strains were clearly written to elude detection. These viruses, often called Stealth, attempt to elude antivirus programs by accessing the system BIOS directly and bypassing the DOS interrupt vector table.

Viruses have been defined and categorized in a variety of ways, but in general, they are known by the objects of their attack: files and disk boot sectors.

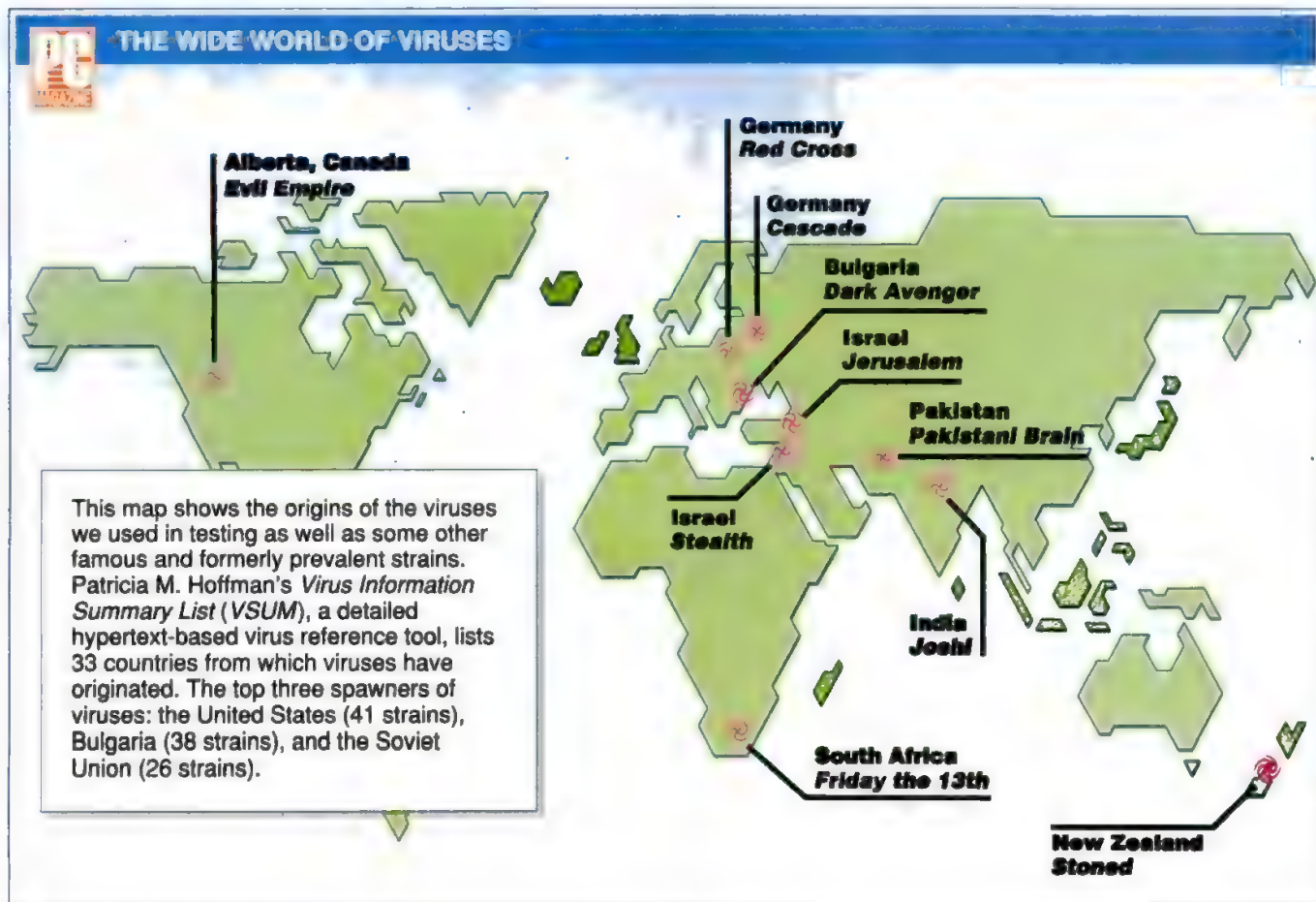
Boot sector viruses spread from PC to PC by insinuating themselves into the

boot sectors of floppy disks. The boot sector is the first sector of a floppy disk, and every floppy disk, whether or not it's been system-formatted to boot, has a boot sector. The virus spreads to hard disks if an infected floppy disk is in the A: drive when the system is turned on. It reassigns the original boot sector to other tracks and sectors on the hard disk, writing over whatever resided there; often, it's the hard disk's partition table or the file allocation table (see the sidebar "Why Your FAT Needs Protection"). The Stoned virus, the most widespread virus on PCs, is a boot sector virus.

File viruses, not surprisingly, attack files. The vast majority invade executable files—.COM and .EXE, as well as overlays, device drivers, batch files, or any other file that can be executed. File viruses typically load themselves into memory when an infected file is executed and spread to uninfected executables as those files are run.

A VIRUS BY ANY OTHER NAME

Unlike "boot sector" and "file," which describe how viruses spread, other labels



January 5 and destroys the hard disks of users who type anything but "Happy Birthday Joshi."

Unlike viruses that attach themselves to other programs, Trojan horses are standalone programs that sit placidly on a disk until someone runs them. Trojan horses usually enter computer systems disguised as a friendly presence, like a

game or utility, and do their damage when the program is executed. Are they actually viruses? They don't spread from file to file or disk to disk by any act of the virus code, but they do spread when users pass the programs along to their friends.

In researching viruses for this evalu-

ation, our one-stop source of up-to-the-minute information was Patricia Hoffman's *Hypertext VSUM*, a massive shareware program that catalogs hundreds of viruses and includes information on their histories, their aliases, and their potential damage. It is constantly updated. Individual users are asked to register the software for a \$30 annual fee, and site licenses are available from \$200. Contact Patricia Hoffman at 1556 Halford Ave., #127, Santa Clara, CA 95051; 408-727-7966; BBS: 408-244-0813. *VSUM* will tell you everything you ever wanted to know about bombs, Trojan horses, and viruses of all kinds.

EDITORS' CHOICE

- *Central Point Anti-Virus*
- *Dr. Solomon's Anti-Virus Toolkit*

Central Point Anti-Virus (\$129) offers a complete antivirus solution that combines reliable virus detection, prevention, and removal with file repair (not just wiping out infected files) and immunization. Its arsenal of antivirus techniques, including routinely updated signature files on some 500 viruses and strains (100 more in the latest release) and the ability to create checksums to rout out unknown viruses, performed well on PC Magazine Labs' tests. Its two memory-resident monitors were on the alert for known and unknown viruses and caught suspicious activity in executable files, boot sectors, partition tables, and FATs. In the case of a total wipeout like a low-level format, *Anti-Virus*'s Emergency Disk automatically restores your PC's vital functions—boot sector, partition table, and CMOS memory.

Central Point Anti-Virus's *Microsoft Windows*-like interface, easy installation, flexibility to run in the background or as an application, thorough documentation, easily negotiable bulletin board, and e-mail facility for direct contact with technical support make it a strong choice for individual users. It runs under *Windows*, is network-compatible, and offers password protection, making it an equally strong solution for corporate use.

Dr. Solomon's Anti-Virus Toolkit (\$149.95) is just as reliable and uses a virus-specific scanner to find almost all known viruses (it missed our strain of Red Cross and

our Totally Hidden Virus), has cryptographic checksumming to detect suspicious activity, presents an easy-to-use interface and excellent documentation, and sells monthly upgrades. *Toolkit* is the only package in this evaluation that can scan for multiple viruses in one pass and has a device driver to check every program before it's launched. It also comes with three inoculation utilities that protect against the most common viruses.

Several packages deserve honorable mention. *VirusCure Plus* detected, prevented, and restored everything in our viral onslaught except our strain of Red Cross and the Totally Hidden Virus. It scans floppy disks, memory, and hard disks, saves signatures of executable files, and upon detection of suspicious activity, returns the file to its original state. Free updates can be downloaded from its bulletin board service.

AntiVirus Plus (\$99.95) registered some false alarms in testing but is a strong performer overall. The program's interface isn't as slick as that of *The Norton AntiVirus* (which has one of the best), but it has just as many setup options. *AntiVirus Plus* was one of the few programs capable of removing and preventing infection by the Joshi boot-sector virus. Like many other packages, it failed to remove the Red Cross virus and PC Labs' specially commissioned Totally Hidden Virus, though in each case its TSR did block the virus from being introduced to the system.

CURES, ANTIDOTES, IMMUNIZATIONS

Virus infections don't always result in lost data or hard disk death. Even after a virus wreaks its damage, file allocation tables often can be reconstructed, files and directories can be undeleted, and hard disks can even be un-reformatted by computer repair services, consultants, or power users equipped with a good set of utilities. But often this means sending a PC out to the repair shop and separating users from their data for hours or even days; and repairs carry a price in dollars as well as productivity.

Antivirus software can ease the pain by detecting and removing viruses before they're triggered, immunizing files against infection, and standing guard in memory to sound an alarm whenever a virus attempts to load. Some products offer only one, or a few, of these features. Others, such as *Central Point Anti-Virus*, *Certus*, and *The Norton AntiVirus* offer the full suite.

Many are able to disinfect files, boot sectors, and memory by removing the virus and leaving the patient intact. It's not too surprising that the products effective in removing our test viruses and restoring disks to their original health came from companies like Central Point Software and Symantec, both of which have produced good disk utilities for years.

Other products, such as *Certus* and *Vi-Spy* perform the electronic equivalent of amputation by killing the infected file or area of the hard disk. This process is effective, but restoration is almost as much of a roll-your-own endeavor as tackling the task with a utility program. A few of the products in this genre ease the chore by providing utilities that let you copy critical boot sector data from healthy, similarly configured PCs.

Antivirus programs use a variety of detection techniques to ferret out infections, including scanning the program code on a hard disk and making byte-by-byte comparisons to known virus code. When the software finds a match, it sounds an alarm. This works, but it leaves the disk vulnerable to new viruses and variants that the software doesn't know about.

Another favorite detection device is the checksum. The antivirus software scans files on the disk and, using an algorithm, assigns a checksum or numeric signature to each one. The checksums are recorded on the disk or stored in a database. When the antivirus software is run again, it scans the files and compares their present checksums to the ones on record. If the checksums don't match, it sounds an alarm to alert the user that files have changed.

Most of the programs reviewed here include prevention features to ward off infections. Often, they feature memory-resident utilities designed to go one-on-one with viruses, preventing them from loading into memory or writing to disk. But utilities can sound false alarms if they don't include a means to determine which activities are legitimate and which are the acts of viruses.

Some programs "immunize" executable files by appending an "integrity statistic," similar to a checksum, to the file. Whenever a file is run, it does a self-check and sounds an alarm when it finds a change. With some programs, including *Central Point Anti-Virus*, programs can "heal" themselves by returning to their original state after a change is detected. However, immunization can interfere with some executables, including small files and those that have overlays or debugging information at the end of the files. And if an executable file does its own integrity check, immunization can set off false alarms.

Fortunately, most programs let you immunize files selectively and allow you to unload their resident utilities to minimize aggravating false alarms.

CHANGING TIMES, CHANGING NEEDS

We evaluated 11 programs when we last looked at this software category ("Infection Protection," April 25, 1989). Today, you'll read about 20 antivirus programs, and these aren't the only options available to virus-wary PC users. This roundup examines software-only solutions. Other protection exists in the form of hardware-

only devices and hardware/software combinations, such as Trend Micro Devices' *PC-Cillin*. The \$139 *PC-Cillin* detects and prevents infections while it saves an image of critical areas of the hard disk in a small EEPROM "hardware immunizer" plug that attaches to the parallel port between the printer and the PC. The plug keeps data free from infection and assures quick recovery from boot sector attacks (800-228-5651, 213-782-8190).

Not only has the number of viruses and antivirus products increased in the past two years, networks have changed the landscape of data security as well. Two years ago, users who didn't swap disks or allow others to use their PCs were virtually immune to virus infection. That's no longer true.

Despite the built-in security features of network operating systems, all users on a network—and even a file server—are vulnerable to a virus attack. The most destructive scenario occurs when a virus attacks the log-on command, which is stored in the DOS partition of the file server and is run every time a user logs on. If it becomes infected, the virus will spread to the workstation of every other user who logs on. If everyone arrives for work at 9 A.M. and logs on within the first hour, the network will be fully infected by 10 A.M.

The more common network infection is isolated to user directories. Many networks are configured to give each user a private set of directories on the file server and access to common directories the user shares with others. Users who bring in games and shareware utilities from home often copy them into the common directories so other users can access them. If the game or utility is a Trojan Horse, woe to those on the network. All those accessing the game stand to infect other executable files in their own network directories as well as the executables on their local hard disks.

Some of the products reviewed are network-compatible. *Central Point Anti-Virus* includes a configuration option that allows network managers to prevent users from logging on before they scan their workstation for viruses. Certus International Corp. offers its product in a network-specific version.

Of course, far more data is lost due to hardware failure, software glitches, power surges, lightning strikes, and users delet-

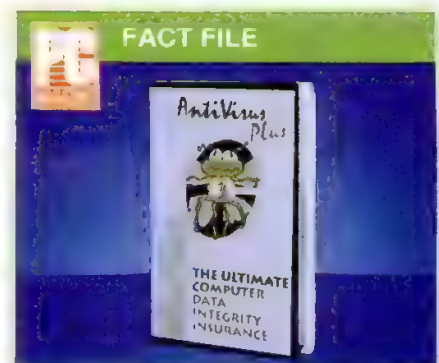
ing long-dormant files they thought they'd never need again than because of virus attacks. But viruses are a threat—and, it would appear, a growing one. Many users will find that simple precautions are all they need to protect their PCs (see the sidebar "Five Common-Sense Tips for Safer Computing"). But if your own work habits, and those of your network compatriots, leave you at risk of infection, a good antivirus program should be a part of your software library. If you're lucky, you'll never need it.

AntiVirus Plus

by Greg Pastrick

The \$99.95 standalone version of Techmar Computer Products' *AntiVirus Plus* is a successful virus prevention and removal package built on three modules—Prevent, Immune, and Cure—which monitor viral symptoms, remove virus code, and scan and restore virus-damaged data to drives and files. It did sound some false alarms on our tests, but they proved to be harmless errors, and the program's performance is balanced by the strength of its viral damage control and repair features.

The program's TSR operations are handled by the Prevent and Immune modules, which work together to screen viral activity. Technical support at Tech-



AntiVirus Plus, Version 3.6

Techmar Computer Products Inc., 98-11 Queens Blvd., #2C, Rego Park, NY 11374; 800-922-0015, 718-997-6666.

List Price: \$99.95.

Requires: 256K RAM, DOS 3.0 or later.

In Short: *AntiVirus Plus* is a highly capable TSR and scanner that removes and repairs virus-damaged files. It proves successful against boot sector virus attacks and offers the easy reconstruction of critical boot sector and partition information.

CIRCLE 396 ON READER SERVICE CARD

you'll hear—"worms," "bombs," and "Trojan horses"—describe how the damage is triggered. There is some debate about what distinguishes them from one another, whether these are subsets of viruses or vice versa, and whether they're even viruses at all. It's like the chicken-and-egg dilemma; the net result of their damage remains the same.

It was a worm that raced through the Unix-based Internet, the nation's largest computer network, in 1988 and infected

more than 6,000 computer systems in a matter of hours. A simplistic definition of a "worm" is that it is the infector of systems that run multiple sessions. To date, worms are generally considered to be the bane of minis and mainframes, not personal computers.

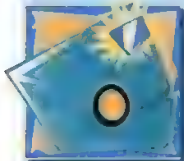
It was a bomb that resulted in the arrest of a disgruntled General Dynamics programmer this summer. Timed to "go off"

after the man resigned, it would have destroyed valuable data about government missile projects if a coworker hadn't discovered it. Bombs like this one are generally not considered to be viruses because they don't spread. They're deliberately planted to strike a single victim. But a bomb is anything that's triggered by a date or event, and many computer viruses contain bombs. The Joshi virus, for instance, writes "Type Happy Birthday Joshi" to the screens of infected PCs on

FIVE COMMON-SENSE TIPS FOR SAFER COMPUTING

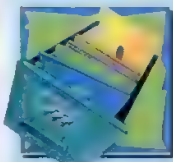
by Carol Ellison

Virus paranoia should be the least important reason for practicing safe computing, but no matter how a disk dies, the effect is equally painful. These five no-cost tips for safe computing will help you reduce your vulnerability and resurrect your files if the worst does occur.



1. If your software allows it, apply write-protect tabs to all program disks before installing new software. If it doesn't, write-protect the disks immediately after installation.

Write-protecting program disks before installation will prevent viruses on an infected PC from spreading to original program files. However, as part of their installation procedures, some manufacturers require that information like the buyer's name, company, and software registration code be written to a program disk before the software can be installed. You'll avoid infecting these disks by doing a hard reset of your system and booting from a clean, system-formatted floppy disk inserted into your A: drive before installing the new software. Do not switch to your C: drive, and don't load any other programs before doing the installation.

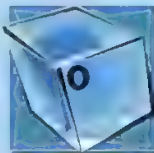


2. Do not install software if you don't know where it's been.

Salesmen, resellers, PC repairmen, power users, and consultants with briefcases full of demo and diagnostic floppy disks are

common carriers of viruses. These disks can pick up a bug from one of the many PCs they're run on and spread it from one company to another or through a single organization. You can isolate such infections by reserving one PC as a demos-only machine, or insisting that consultants and PC repairmen certify that their own disks are virus-free before they try to run them on your systems.

In general, the programs you find in shrink-wrapped packages and on-line vendor forums, such as those on CompuServe and GEnie, will be virus-free. PC vendors typically scan their own programs for viruses before releasing them to the public, but programs posted on bulletin boards may not have been scanned. Before downloading programs to your hard disk, it's a good idea to check out their origin. Be wary of programs that don't identify the program author, and if you've never heard of the author or the company that markets the program, attempt to contact the vendor before installing its software.



3. Make your executable file read-only.

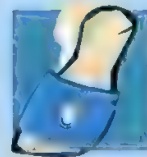
This won't prevent virus infections, but it can help contain those that attack executable files. Designating executable files as read-only is easier and more effective on a network, where system managers control read/write access to files, than it is on an individual PC. Individuals can change file attributes to read-only using DOS's ATTRIB command. You can accomplish this in two easy steps by entering

```
ATTRIB +R *.EXE /S
```

then

```
ATTRIB +R *.COM /S
```

at the command prompt of the root directory for each of your drives. When used with the wildcard, the +R switch makes all files with the .EXE and .COM extensions read-only. And the /S switch applies the command to all such files in each directory and subdirectory on the drive.



4. Abolish SneakerNet.

Boot sector viruses are especially pernicious. The most common virus, Stoned, travels in the boot sector of floppy disks, which are passed from user to user and PC to PC. If an infected floppy disk is left in the A: drive and a user turns on the PC, the virus will spread to the hard disk as quickly as the "non-system disk" error message appears on-screen. You can minimize the possibility of spreading boot sector viruses by transferring data files via networks, E-mail, or direct modem connections instead of copying them to floppy disks that you carry around the office.

5. Back up.

We've said it before, and we'll say it again. The only way to be sure your files will be around tomorrow is to back them up today. Good backups will spare you an ulcer no matter what disaster you face. Your data will be safe not only from viruses but also from accidental erasures and coffee spilled over the PC. ■



**STACKER™
SOFTWARE
DOUBLES
YOUR DISK
CAPACITY.**

DOUBLES
YOUR DISK
CAPACITY

Used to be, when your hard disk got full you had to empty your wallet and buy a bigger one.

Or, you could buy yourself some time by deleting a bunch of your files.

At Stac, we didn't think this was much of a choice. So we invented Stacker.

In the process, we created an instant bestseller. Which isn't surprising, considering that Stacker instantly gives you twice the disk capacity you had before.

Now, aren't you glad you didn't rush out and buy a new hard disk?

How?

By compressing all the files on your disk—applications, utilities, documents, spreadsheets, data, everything—using our patented Stacker LZS data compression technology.

Don't know a thing about data compression?

Don't worry. You don't have to.

In fact, you don't have to think about Stacker at all.

Stacker works behind the scenes, expanding your data when you need it and compressing it again as it goes back to disk.

Automatically.

It doesn't even matter what kind of software you use. Because Stacker is 100% compatible with everything from business and graphics programs to undelete utilities and low-level formatters.

Not to mention the latest versions of DOS[®] and Windows[®].

If you think doubling your disk capacity will slow you down, think again.

You see, Stacker is fast. So fast, in fact, that it actually improves the performance of many of your applications.

Stacker is also 100% safe—something no other data compression product on the market can say.

Which explains why every leading utility software publisher and tape drive manufacturer uses our technology in their own products.

Speaking of software publishing and hardware manufacturing, we do both.

Which means we give you a choice.

If your PC can't spare a slot, or if your PC is a portable, a laptop or a notebook, the software on the opposite page is just what you need.

But if you're one of those

who insist on smaller driver size and the highest possible speed and compression ratio, you'll want to install one of our three hardware versions.

Installation, by the way, is a snap. Just plug the board into any slot—no jumpers or switches to set.

The software practically installs itself. It even optimizes your disk for you.



In addition to the software-only version, Stacker is now available in three co-processor-with-software versions: Stacker XT/8, Stacker AT/16 and Stacker MC/16, each featuring the unique Stacker LZS chip.

To find just how much Stacker can do for your disk, your data and your wallet, call 1-800-225-1128 Ext. 726. Or ask your dealer for a demonstration.

And see how well we Stac up.

STAC

The Data Compression Company



As data is stored on your disk, Stacker instantly compresses it. Then, when your PC reads the data, Stacker instantly expands it. You don't have to do a thing.



THE ONLY WAY TO TAKE CARE OF BUSINESS IS TO TAKE CARE OF BUSINESS.

THE CORPORATE SERIES™

The new Hyundai® Corporate Series™ provides 486/33, 486SX/20 and 386/40 performance in a single upgradeable system. And at a very business-like price.

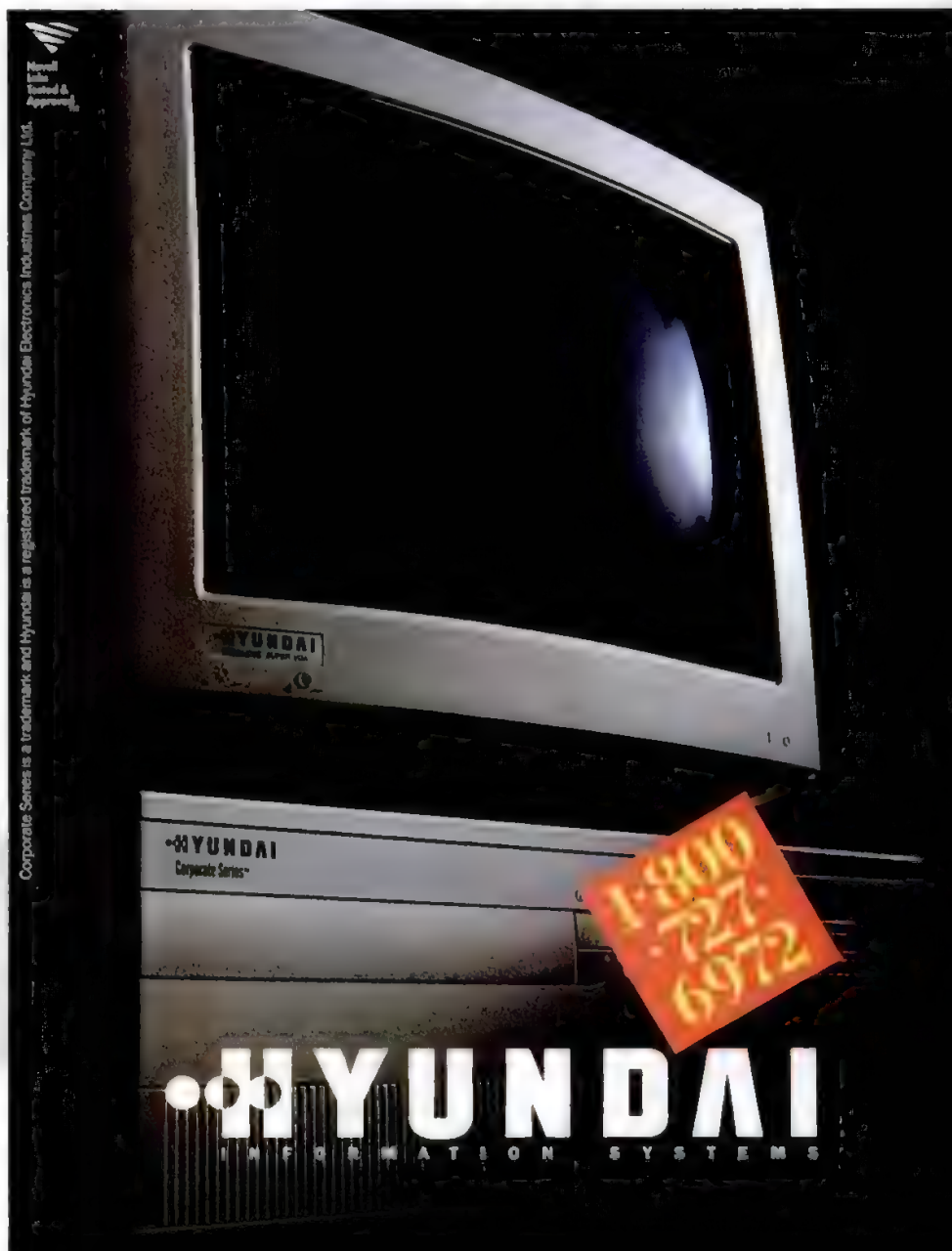
The Corporate Series uses leading-edge technology to offer business users an unrivaled combination of ultimate speed and low-cost upgradeability.

A microprocessor module plugs into the motherboard on a simple-to-install card, allowing system upgrades to be made rapidly and affordably. And an innovative snap-together case enables cards, drives and processor modules to be added in minutes to configure the Corporate Series to meet the needs of any demanding application.

Backed by an eighteen-month warranty, a nationwide dealer network and an optional 24-hour "Service-on-Site" program, Hyundai is today's clear choice for taking care of business. No question about it.

Hyundai Electronics America, 166 Baypointe Parkway, San Jose, CA 95134

CIRCLE 525 ON READER SERVICE CARD





Save the month. Save the week. Save the day.
Secure your data with our free offers.



Free anti-static mouse pad, backup label sets, and data security handbook.*
Make backup easier and more systematic. Buy specially marked packages of 3M data cartridges and choose either our standard or premium data security offer. See package for details.

With virtually every size and format data cartridge you'll need—20 megabytes to 1.35 gigabytes—it's no wonder more business protects important information on 3M brand data cartridges and diskettes than any other brand in the world. Call 1-800-888-1889 ext. 14 to find out more.

Innovation working for you™

See package for details. © 3M 1991
All data cartridges require a compatible drive.
*Contents of premium offer.

CIRCLE 521 ON READER SERVICE CARD

3M | 
Worldwide Sponsor 1992 Olympic Games
601-541-0901

You've probably seen recent press articles on "repetitive motion" injuries suffered by computer users. The problem is significant. Workstation design and worker rest periods have already been regulated in San Francisco; federal guidelines will follow.

Logitech can help.

We make computer mice, and more of them than any other company.

Mice not only make computing easier and faster but, when correctly shaped for an individual's hand, they reduce the risk of repetitive

Are PC Users Working Th



MouseMan™ —

MouseMan —

MouseMan Cordless

First™ Mouse —

motion injuries.⁽¹⁾

Working closely with industrial designers, medical

and ergonomics researchers, and consumer testers, we've developed mice that are more

1 Based on research by World Health Org., US Dept. of Health and Human Services, Logitech, and others; included in backgrounder referenced above.

Put Your Fingers To The Bone?



TrackMan™ —
uses the power and
dexterity of the thumb

TrackMan Portable —
ideal laptop/desktop
solution

Kidz™ Mouse —
makes computing
fun and easy

Keyboard Wrist Pad™ —
over 35% off
participating dealer

comfortable in more types of
hands (left and right) than
any other brand. And their

shape, weight, sensitivity and
three-button programmability
minimize user effort.⁽¹⁾

Available for IBM® compatible
personal computers, Macs®,
and Sun™ workstations, each
mouse carries a lifetime
warranty and software com-
patibility guarantee. Try them
where you see our hands-on
dealer display. Corporate
buyers might also want to
read our detailed backgrounder
on the subject — *Computing
Ergonomics*. For a copy, or the
location of your local dealer,
call 800 231-7717 ext. 310.



Tools That Power The Desktop.

PC Magazine caught us speeding.

"PacificPage XL beats HP on LaserJet PostScript printing"

PC Magazine, June 25, 1991

FASTEST PRINTING SPEED. LOWEST PRICE.

PacificPage XL is fast. So fast, that PC Magazine has cited it for exceeding the speed limit of Hewlett-Packard's PostScript® Cartridge by more than six times.

If by chance the speed doesn't sell you, the low price will. Because it's the one feature of PacificPage XL that doesn't exceed HP's cartridge.*

How do we get it to work so fast? It's really quite simple. We've taken our award-winning PostScript language emulation cartridge called PacificPage P•E, and combined it with a high speed accelerator board that installs easily into your LaserJet IIP, III, IIID or IIIP printer memory slot. LaserJet printing speeds are boosted by the fast Intel i960™ RISC processor that's mounted on the board alongside 2 MB of printer memory.

"An Intel i960 RISC processor on the accelerator board helps the PacificPage XL print graphics more than six times as fast as the HP PostScript Cartridge."



"PacificPage XL provides the fastest PostScript printing available on a desktop."

Do you use a shared printer? If you do, you'll definitely want the speed of PacificPage XL. Because output is printed so fast, other users won't have to wait for their jobs to print.

Make a quick price/performance comparison and you'll see — PacificPage XL is the smart choice!

35 POSTSCRIPT COMPATIBLE FONTS

Acquiring stylish, professional looking output is easy with PacificPage XL. Because we've included 35 fully

COURIER
SWISS
SWISS NARROW
DUTCH
ZAPF
CALLIGRAPHIC
GEOMETRIC
REVIVAL
CENTURY
CHANCERY

Zapf Dingbats
* * * * *

Symbol
◀ ▶ ◊ ◈ ◉ ◊ ◈ ◉

Each typestyle comes in normal, bold, italic and bold italic treatments except for Chancery, Zapf Dingbats, and Symbol.

"The native 35 PostScript compatible fonts in PacificPage XL are Bitstream designs, some of them superior to Adobe's version."

scalable Apple LaserWriter equivalent fonts. These high quality Bitstream designs provide you with the tools you need to create output that shines. For even greater versatility, PacificPage XL supports Bitstream's Speedo fonts and Adobe Type 1 and 3 fonts.

100% POSTSCRIPT LANGUAGE COMPATIBILITY — GUARANTEED

Today, many HP LaserJet users are lead to believe that only true Adobe PostScript gives true PostScript capabilities. The truth is, PacificPage XL provides exactly



PostScript file output from Apple LaserWriter IINTA

PostScript file output from LaserJet III with PacificPage XL

"PacificPage XL swiftly and accurately renders some test EPS files that other interpreters distort and had no trouble with any of the large and complex images used for testing."

the same graphics capabilities for your LaserJet as Adobe PostScript. Exactly. So you can pay more for a name and get less for your money. Or you can pay less and, in addition to speed, get all of PostScript's powerful graphics functions. If you can create it, PacificPage XL can print it. We're so sure of it that we give you our money back guarantee of satisfaction.

For more information or a dealer near you, contact Pacific Data Products, 9125 Rehco Road, San Diego, CA 92121, (619) 597-4608, Fax (619) 552-0889.

GUARANTEED
OR YOUR MONEY BACK

See us at Comdex-Booth #840 LVCC

* Suggested list price effective 8/15/91 and includes the cost of 2 MB of memory. Quotes reprinted from PC Magazine, June 25, 1991. © 1991 Ziff Communications Company. PacificPage XL and PacificPage P•E are trademarks of Pacific Data Products, Inc. Adobe and PostScript are registered trademarks of Adobe Systems Inc. HP and LaserJet are registered trademarks of Hewlett-Packard Company. i960 is a trademark of Intel Corporation. All other product, company, and typeface names are trademarks of the company or manufacturer respectively. ©1991 Pacific Data Products, Inc.



PACIFIC
DATA PRODUCTS

AntiVirus Plus can
maintain a
historical record
of file changes.

SOFTWARE ANTIVIRUS SOFTWARE

users. Site license fees start at \$3,100 for 100 users. Virus update notices are sent out every two months for a fee of \$29 and are backed up with a direct line and BBS service for technical support.

AntiVirus Plus is worth looking into. It's a highly capable and straightforward virus prevention and removal program.

Central Point Anti-Virus

by Carol Ellison

mar calls Prevent's monitoring of interrupts, DOS code, and memory an adaptive technique that halts infected program execution when changes have occurred. Prevent also performs a comparison of the critical boot and partition signature files, which are created on installation of the software.

Meanwhile, the Immune module monitors DOS interrupt calls, disk I/O, and memory, and automatically extracts virus code upon detection of a known virus. Depending on the type of viral activity, either module may trigger a virus warning and prompt for the use of the Cure module for a virus scan, identification, and removal of an infected file.

In addition, the program comes with a checksumming module that may be used separately to maintain a historical record of file changes.

RECONSTRUCTION OPTIONS

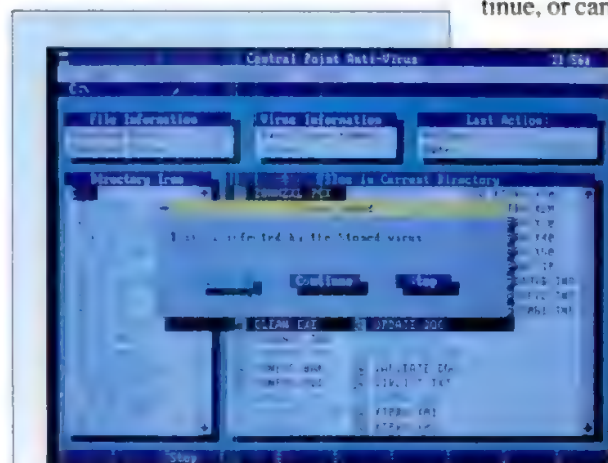
While the program's interface and configuration screens are not as sophisticated as those found in *The Norton AntiVirus*, its installation routine is just as automatic, and the option selections are equally broad. Techmar offers uninstall routines for the program and adds a feature for reconstructing boot and partition information.

The test results highlight *AntiVirus Plus*'s strength. It was one of just a few programs capable of removing and preventing infection by the Joshi boot-sector virus. Like many others, the *AntiVirus Plus* scanner failed to detect or remove the Red Cross virus and PC Labs' specially commissioned Totally Hidden virus, though in each case its TSR did block the virus from being introduced to the system. False alarms were registered by the program in the course of testing the Dark Avenger and Joshi viruses; the program still identified the system as infected after the viruses had been removed.

Techmar's network version of *AntiVirus Plus* lists at \$299.95 for 10 users, \$499.95 for 20 users, and \$649.95 for 30

When the maker of *PC Tools Deluxe* introduced *Central Point Anti-Virus*, Version 1.0, in May, it made its point in colorful advertisements that pictured a lineup of monitors displaying symptoms of infection. Central Point Software admits to taking artistic license in the ad; few virus infections are quite so colorful. But *CPAV* knows what it's looking for. Embracing a variety of virus detection techniques, this \$129 program operates in the background to alert you of suspicious activity that may indicate the existence of a virus. The program then scans hard disks for infections, and in most cases removes viruses and repairs damage.

CPAV is menu-driven, easy to install, and mannerly at the keyboard. The quick install creates an *CPAV* directory, copies program files, and rewrites CONFIG.SYS



Central Point Anti-Virus allows a systems manager to customize messages that direct users to the appropriate person if the program detects a virus.

FACT FILE

EDITORS' CHOICE



Central Point Anti-Virus, Version 1.0
Central Point Software, 15220 NW Greenbrier Pkwy., #200, Beaverton, OR 97006, 800-445-4208, 503-690-8090

List Price: \$129.

Requires: 512K RAM, DOS 3.0 or later.

In Short: An invisible guardian, *Central Point Anti-Virus* is gentle on users and system resources. It peacefully coexists with other programs as it scans disks, removes infections, and repairs or restores damaged files and disk sectors.

CIRCLE 397 ON READER SERVICE CARD

or AUTOEXEC.BAT to automatically load one of two memory-resident monitors—VSAFE or VWATCH—and invoke BOOTSAFE, a utility that checks for viruses in the system's boot sector, partition table, and file allocation table. If you don't want to run the 24K VSAFE in the background, you can do a manual installation and run *CPAV* as an application or install the 8K VWATCH.

VSAFE pauses keyboard activity when it detects unusual activity, such as odd disk formats and changes in executable files, and waits for you to reboot, continue, or cancel; VWATCH halts the system when it detects strange behavior. If you can pay the price in memory, you'll find VSAFE less obtrusive.

ON-LINE UPDATES

CPAV includes a signature file of program code on more than 500 viruses, which Central Point routinely updates by posting additions on its bulletin board and on its CompuServe forum. You can also update the program

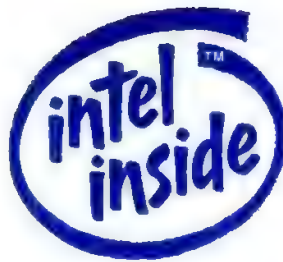
by entering signatures directly into the pattern file.

On installation, *CPAV* scans your system memory and files for viruses, as well as the boot sector and partition table of your hard disk. Scanning 20 files per



How to spot the





very best PCs.



It's really quite easy. Just look for PCs that have a genuine Intel microprocessor inside. Either the Intel386,TM Intel386 SX, Intel386 SL, Intel486TM or Intel486 SX microprocessor.

Intel is the world's leader in microprocessor design and development. In fact, Intel introduced the very first microprocessor. So with Intel inside, you know you've got unquestioned compatibility and unparalleled quality. And you'll

know you're getting the very best PC technology.

So look for the Intel Inside symbol on ads for leading PCs. Or call 800-548-4725 for more information. It'll show you've got an eye for spotting the best.

intel.
The Computer Inside.TM

SOFTWARE
ANTIVIRUS SOFTWARE

Certus

by Carol Ellison

second (according to Central Point), the program sounds an alarm when it finds a virus and displays a dialog box of suggestions, typically recommending that *CPAV* remove the virus from the infected file or area of your hard disk and that you reboot to make sure you have cleared the virus from memory.

When installing *CPAV*, you create an Emergency Disk, a bootable floppy disk to which *CPAV* copies an image of your PC's boot sector, partition table, and CMOS memory, along with a copy of its own *BOOTSAFE* utility (to protect the boot sector of the disk). If a virus should wreak havoc on your hard disk, your CMOS battery should die, or an adventuresome user decides to see what *FDISK* does, you can use this emergency disk to reboot from your A: drive and easily restore the information.

At your option, *CPAV* scans either all files or only executable files. To protect against unknown viruses, it creates and stores checksums on each file and alerts you to any changes. You can update checksums if you know the file should have changed, or you can scan changed files for viruses.

IMMUNIZING FILES

Once you're sure your system is clean, *CPAV* can immunize files against infection. This adds a little less than 1K of protection code to files that are susceptible to virus infection, such as .EXE, .SYS, .OVL, .BIN, .PRG, and .CMD files. Once immunized, the file itself can notify you when it changes and heal itself by returning to its original state.

Not all files can be safely immunized. After immunization, some programs return a "Packed file is corrupt" error message when run. *CPAV* dutifully notifies you in advance of files that should not be immunized.

CPAV's excellent documentation explains the mysteries of virus functions and their abilities to intercept and redirect DOS command calls. Its index of common viruses, their origin and symptoms, is interesting enough to qualify as reasonable bedtime reading.

Version 1.1 of *CPAV*, which is now shipping but arrived too late for evaluation here, adds more than 100 new virus signatures to its scan list along with support for extended and expanded memory. *VSAFE* and *VWATCH*, the TSR monitors, have been made somewhat smaller as well.

Certus International Corp. markets its namesake antivirus program as an enterprise-wide PC and LAN security system. Priced at \$189, *Certus*, Version 2.1, offers many levels of security and should delight systems managers who can clone one installation and readily copy it to other PCs. For individual users who want a more-basic program that can repair infected files, *Certus* will market a virus detection and removal program called *Novi*, which was still in development at the time of this evaluation.

The program's memory-resident virus scanner loads in just 3K RAM—one of the smallest we've seen—and scans for more than 300 unique virus codes in high memory as well as conventional RAM. Its slim memory usage and ironclad prevention techniques earned it an Editors' Choice when PC Labs last tested antivirus software ("Infection Protection," April 25, 1989). Since then, some of *Certus*'s good ideas—password security and a special disk to restore and set up damaged hard disks instantly—have been adopted by competitors.

During installation, *Certus* scans for viruses, but its cure for infections can be as deadly as the virus itself if you've

failed to back up and catalogue your program disks. *Certus* kills the infected file or section of the hard disk where the virus resides unless you ignore its warnings or add the infected file to an "approved" program list. The new *Novi* package will remove viruses and repair infected files, which is something more like microsurgery than amputation.

Certus shines as a preventive mechanism. It effectively blocked all of our test viruses from making their way onto the hard disk. Where other programs shielded the disk from the menacing boot-sector virus *Joshi* by allowing it to sneak onto the hard disk and then removing it, *Certus* completely blocked its entrance by simply forbidding the system to boot to the C: drive until we removed the offending floppy disk carrier from the A: drive, a sound strategy.

NO RUNS, NO WRITES

Virus infection is only one of several doomsday scenarios *Certus* guards against. It can wrap a PC in software armor so thick that users cannot accidentally erase files or reformat hard disks. Using passwords, a systems manager can assign users different levels of access to a PC. At the most restrictive level, *Certus* will not run new or modified software.

The program keeps an activity log and audit trail of disk writes that can be helpful in evaluating software usage. It tracks unusual activities and diagnoses hard disk problems.

Certus also provides protection against mishaps and misdeeds, such as dead CMOS batteries and novices who wander into a utilities directory to try out unfamiliar tools. The installation procedure makes you create a Critical Disk that records an image of your system's boot sector on a bootable floppy disk. If the unthinkable virus wipe-out does occur, you insert this disk in the A: drive, turn on the PC, and use *Certus*'s *REBOOT* command to restore the CMOS setup, partition table, and hard disk setup files.

The company offers liberal corporate discounts and site licensing arrangements that only add to the program's attractiveness in pinstripe environments. If you're buying for an office where standardization reigns, *Certus*'s control options may be exactly what you need. For individual users who find the restrictions too limiting, check out one of the other programs evaluated here, or call *Certus* for information on its new *Novi* software.



Certus, Version 2.1

Certus International Corp., 13110 Shaker Square, Cleveland, OH 44120; 800-722-8737, 216-752-8181.

List Price: \$189; LAN 10-Pack, \$1,395.

Requires: 384K RAM, DOS 3.1 or later.

In Short: An excellent preventative, *Certus* medicates viruses by killing infected files.

Certus is recommended for offices with solid backup strategies and libraries of original program disks, not for individual users or really diverse PC environments.

CIRCLE 398 ON READER SERVICE CARD

Data Physician Plus

by Henry Fersko-Weiss

A grab bag of programs from Digital Dispatch, *Data Physician Plus*, Version 1.3C, packs eight programs onto three floppy disks for a list price of only \$49. Some of the programs are highly specialized, but they all complement each other in some way. If you're willing to spend some time with these programs to decipher the correct program for the problem at hand, *Data Physician Plus* can protect your system and remove viral infections.

All of the programs use the command-line approach, and a few have screens for installation or maintenance. Only VirHunt—one of three main modules—offers true screen and menu operation.

VIRUS INTERCEPTION

The three modules with the broadest applications are Resscan, VirAlert, and VirHunt. The memory-resident Resscan monitors files, the boot sector, and memory for viruses. It checks for virus signatures and uses checksums and CRC checking. VirAlert, a device driver placed in the CONFIG.SYS file, operates continually in the background and intercepts attempts to manipulate executable and operating-system files, activity that may indicate a virus attack.

VirHunt is a virus scanner that detects and removes most known viruses and their variants. The first screen starts a search and lists all search parameters. From the second screen, you select the directory to search, specify executable files or all files, decide whether to remove viruses or overwrite infected files, and print scan results.



Data Physician Plus, Version 1.3C
Digital Dispatch Inc., 55 Lakeland Shores Rd.,
Lakeland, MN 55043; 800-221-8091,
612 436-1000.

List Price: \$49.

Requires: 20K to 256K RAM, DOS 2.0 or later.

In Short: While *Data Physician Plus* does a good job of scanning, monitoring, and removing viruses, the eight programs that make up the package can cause confusion. All but the scan program are command-line-driven, making the collection less than user-friendly.

CIRCLE 399 ON READER SERVICE CARD

SOFTWARE ANTIVIRUS SOFTWARE

Data Physician Plus
was able to block
the Totally Hidden
Virus.

The other programs in *Data Physician Plus* are thrown in for good measure. Some of them can be applied broadly, such as RS-Net, which assists Resscan on a LAN. Others have very narrow applications. Unkill, for example, restores a disk damaged by the Disk Killer virus. The most useful of these secondary programs is Antigen, which attaches virus protection directly to individual executable programs by replacing the normal DOS file header with a 4.5K security prefix.

EXTRA VIGILANCE

Data Physician Plus did well in antivirus testing. Using a combination of Resscan and VirAlert, it prevented all attacks, except for Joshi. Thanks to VirAlert's vigilance with executable files, the program was even able to block the Totally Hidden Virus. VirHunt detected every test virus and removed all but Red Cross, a strain unknown to the programmers at Digital Dispatch.

Data Physician Plus prevents, detects, and removes most known viruses quite handily, but the variety of small programs can cause confusion, which the documentation doesn't help to clarify. If you enjoy the challenge of figuring it out and like the \$49 price, then *Data Physician Plus* may be your antivirus program of choice.

Dr. Solomon's Anti-Virus Toolkit

by Jim Quraishi

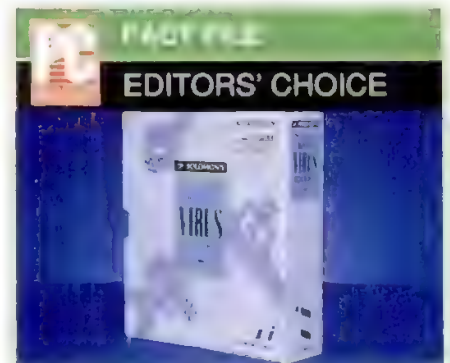
Ontrack Computer Systems' *Dr. Solomon's Anti-Virus Toolkit* is a comprehensive set of top-notch antiviral utilities, worth its \$150 price. This high-end program, created by Dr. Alan Solomon, a leading British antiviral researcher, is a collection of utilities united by a consistent and simple interface.

Toolkit's four menus—Checks, Protections, Disinfectants, and Miscellaneous Tools—provide access to some but not all of the bundled programs. The three most important programs used to catch and kill viruses are GUARD, which protects your clean drives from future infection; CHKVIRUS, which supplements protection with cryptographic checksums; and FINDVIRUS, which detects viruses by name.

DEVICE DRIVER PROTECTION

GUARD, a 4K device driver, provides on-line viral protection. Many Stealth viruses can bypass a TSR, so loading GUARD as a driver gives the program a better chance at foiling such critters. Once installed, GUARD checks every file before it's loaded and executed. It will also check the files as they are copied from one disk to another. You will probably want to add a statement in AUTOEXEC.BAT to load GUARD automatically every time you boot.

One of *Toolkit's* three inoculation utilities, INOCULAT inoculates against the 34 most common viruses by putting the signatures of those viruses in your programs. If the virus hits, the inoculated programs are spared. INOCINT inoculates Interrupt hex 21, and INOCMEM inoculates memory against Icelandic, December 24, Vaccina, and MIX1 viruses. Inoculation can be a waste of time, but if you are getting infected by a par-



Dr. Solomon's Anti-Virus Toolkit, Version 5.0

Ontrack Computer Systems Inc., 6321 Bury Dr., Eden Prairie, MN 55346; 800-752-1333, 612-937-1107.

List Price: \$149.95; first-year upgrade, \$130.

Requires: 512K RAM, DOS 3.0 or later.

In Short: *Dr. Solomon's Anti-Virus Toolkit* is an easy-to-use, effective scanner that prevents, detects, and removes all major viruses. It comes with an excellent manual, frequent upgrades, and good technical support.

CIRCLE 400 ON READER SERVICE CARD

This is a giant step in



In a recent article, *PC Computing* named only one computer "the ultimate PC."

The Everex™ STEP™ Megacube™

"Working with the Megacube is sheer joy... It gives me everything I'm looking for," said the reviewer.* Such unequivocal praise is no overstatement. Because with the STEP Megacube, Everex has achieved not one design breakthrough — but several.

A BIG STEP FORWARD LEAVES OTHERS BEHIND.

The powerful combination of Intel's hot i486™/33 CPU chip and Everex's proprietary Advanced Memory Management Architecture (AMMA™), a second level cache of up to 256K, makes for a warp speed of 20.8 MIPS.**

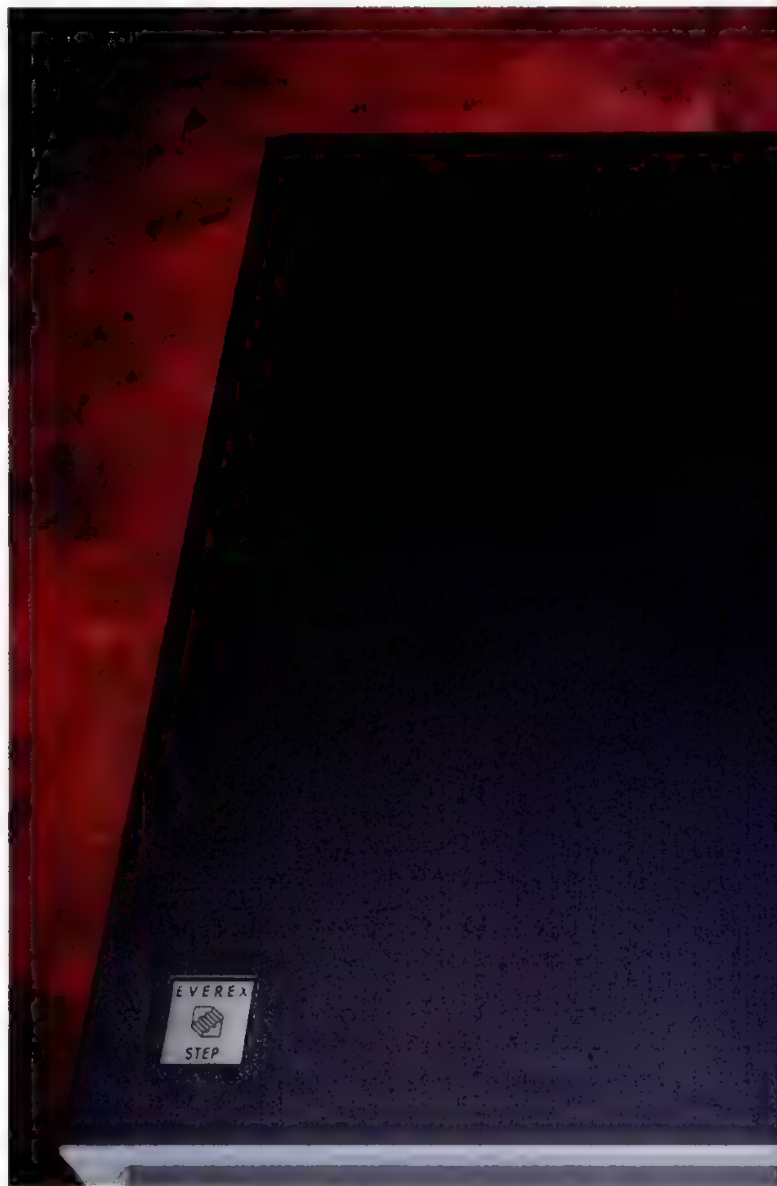
And with 12 expansion slots, 8 drive bays, a 400-Watt power supply, and up to 64MB of memory—enough for even the most demanding applications—the STEP Megacube has more expansion capabilities than any computer on the market today.



THE ULTIMATE PC IS THE IDEAL FILE SERVER.

Everex has designed a powerful network server specifically to meet the requests of network and multiuser system administrators like yourself. Not only do you want a topnotch server that's expandable and performs well, but you also want reliability and serviceability.

In the STEP Megacube, you'll find everything you asked for and more. For example, recognizing that security is all-important on a network,



The STEP MegaCube is the first system to incorporate advanced thermal management to prevent problems caused by overheating. The Everex Thermal Management

STEP MEGACUBE 486/33

- | | |
|--------------------------------------|---|
| ■ 20.8 MIPS | ■ Everex Thermal Management System (ETMS) |
| ■ 486/33 Microprocessor | ■ Side panels and drive bays mounted with thumbscrews |
| ■ 8 Half-height drive bays | ■ Chassis locks |
| ■ Up to 64MB of RAM | ■ Password protection |
| ■ 256K Cache | ■ Upgradeable to future-generation motherboards |
| ■ 10 of the expansion slots are EISA | |
| ■ 400 Watt power supply | |

personal computing.



Everex has built in password protection to ensure that data remain safe from unauthorized users. And the STEP Megacube is even available preconfigured for Novell® Netware.

A COMPANY THAT'S ALWAYS A STEP AHEAD.

But file serving is not all the Megacube was designed for. On the contrary, this multifaceted computer performs equally well as a graphics workstation and multiuser system. You won't find a more versatile system anywhere, nor one with so many design firsts.

Megacube design innovations include everything from a distinctive cube design to a unique thermal management system that eliminates reliability problems caused by the heat from high-performance systems. And don't forget the remarkably low base price of \$4,559***.

But this should come as little surprise to anyone familiar with Everex and our wide range of quality computer products. At Everex, our mandate is "Always innovate, never compromise."

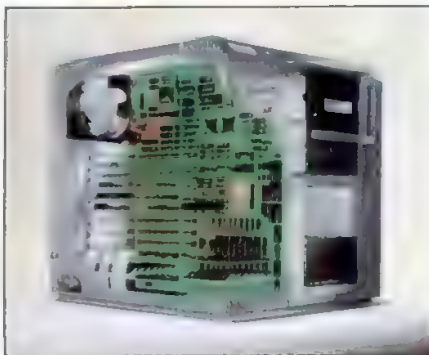
TAKE A GIANT STEP.

To find out more, call 1-800-258-STEP or mail the reply card.

It's certainly a STEP in the right direction.

System (ETMS™) maintains lower internal temperatures, and a dual compartmental design separates the microprocessor and disk drives, the hottest system components.

The entire interior of the cube is accessible in seconds through sidepanels, using thumbscrews. So it can be easily serviced without being moved, and without removing devices stacked on top of it. Everex has designed a special hydraulically-dampened door to keep dust and contaminants out of components that are accessible from the front of the system.

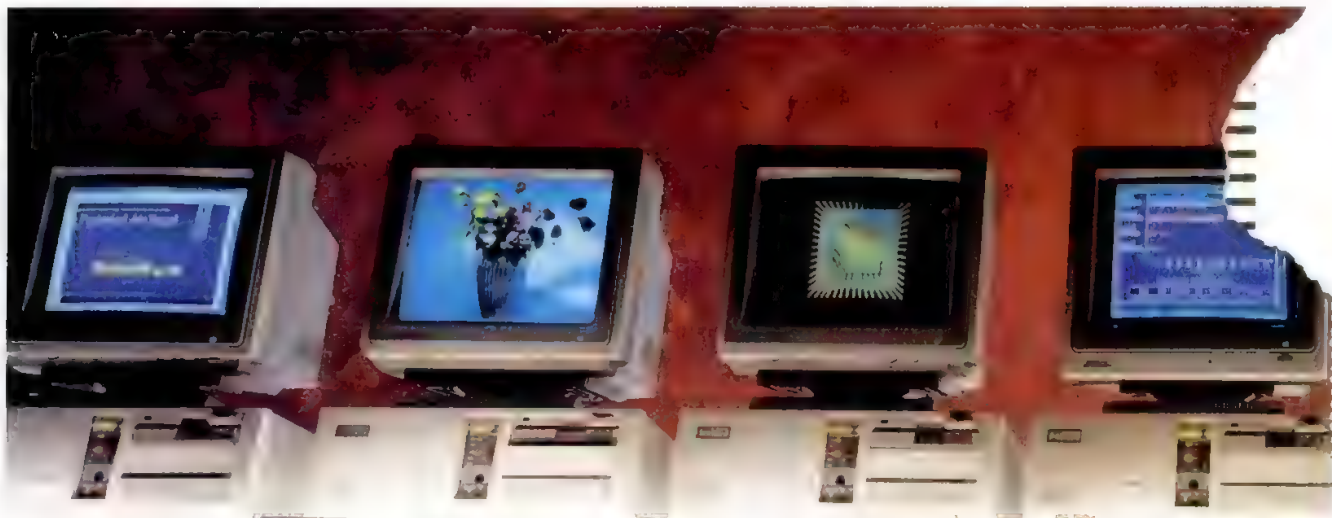


EVEREX
EVER for EXcellence®

*Reprinted from PC Computing, June 1991. ©1991, Ziff Communications Company. **MIPS Source: Intelligent Devices' High Test Benchmarking Software. ***Suggested retail price for Megacube 386/33 with 8 MB RAM. International Operations: Canada: 800-661-2001, France: 33 1 69 07 60 41, Hong Kong: 852 389 2365, Spain: 341 430 9212, U.K.: 44 81 205 0607 GSA # GS00K90AGS5253. EVER for EXcellence is a registered trademark, and Everex, STEP, Megacube, ETMS, AMMA and Always a Step Ahead are trademarks of Everex Systems. 1486 and the Intel Inside Logo are trademarks of Intel Corporation. Novell is a registered trademark of Novell, Inc. ©1991, Everex Systems, Inc.

CIRCLE 113 ON READER SERVICE CARD

And here are se same c



STEP 386SX/20
 • 4.6 MIPS*
 • 1-16MB RAM
 • Starting at \$1,899**

STEP 386/20
 • 6.7 MIPS
 • 1-64MB RAM
 • Starting at \$1,999

STEP 386/25
 • 8.1 MIPS
 • 1-64MB RAM
 • Starting at \$2,049

STEP 386/33
 • 10.4 MIPS
 • 1-64MB RAM
 • Starting at \$2,499



The STEP Megacube isn't the only Everex STEP™ computer that outruns the competition. Any STEP you take gives you the best combination of price, performance and innovative engineering available in the PC industry.

SEVERAL STEPS THAT LEAVE OTHERS BEHIND.

The STEP line offers Everex's proprietary Advanced Memory Management Architecture (AMMA™), a second level cache of up to 256K. That increases cache hit rates to as high as 99% — maximizing overall performance.

And like the Megacube, the entire

STEP line is expandable. Each computer has 8 or more expansion slots. And up to 64MB of RAM (up to 16MB in the STEP 386™SX).

What's more, with an IN STEP direct CPU replacement board, all 386DX STEP computers are easily upgradeable to i486 systems.

STEP's LED display provides detailed status

Key to the STEP's blazing speed is Everex's proprietary Advanced Memory Management Architecture (AMMA), a second level cache of up to 256K.



With every STEP computer, the following items are included free:

Suggested Retail Value

FREE Windows™	\$145
FREE Mouse	\$80
FREE MS-DOS™ 5.0	\$130
FREE 1-year parts and labor warranty	NC
FREE 1-year on-site service†	\$250
	\$605

†on-site service also covers all Everex peripherals in the computer system

veral steps in the irection.



STEP 486SX/20
• 13 MIPS
• 1-64MB RAM
• Starting at \$2,999

STEP 486/25
• 16.2 MIPS
• 4-64MB RAM
• Starting at \$4,699

STEP 486/33
• 21.7 MIPS
• 4-64MB RAM
• Starting at \$5,399

STEP 486/33 EISA
• 20.8 MIPS
• 4-64MB RAM
• Starting at \$5,799

and error messages in English—not code. So problems can be identified and remedied faster, resulting in less downtime.

Everex has also added Programmable Configuration Select, so no diskettes or jumpers are needed for setup. And Programmable Drive Tables allow virtually any drive to be installed and used to its fullest capacity.

Should you ever need service, it's comforting to know that every STEP



Detailed status and error messages appear on the STEP's LED display in English—not in computer code—so troubleshooting time is shortened.

computer is backed by one-year warranties for on-site service and for parts and labor. (A three-year parts and labor warranty is also available.) Knowing Everex, you'd expect nothing less. After all, we insist on quality and reliability in every computer product



we sell. In fact, Dataquest*** recently rated Everex number one in customer satisfaction.

TAKE YOUR NEXT STEP

Call 1-800-258-STEP to find out more about the STEP line or mail the reply card. You'll soon discover how far a STEP can take you.

EVEREX
EVER for EXcellence

*MIPS Source: Intelligent Devices' High Test Benchmarking Software **All prices are suggested retail. Actual prices may vary. ***Dataquest PC Customer Satisfaction Study 1990 International Operations Canada 800-661-2001, France: 33 1 69 07 60 41, Hong Kong: 852 389 2365, Spain: 34 1 430 9212, U.K.: 44 81 205 0607 EVER for EXcellence is a registered trademark, and Everex, STEP, Megacube, AMMA and Always a Step Ahead are trademarks of Everex Systems. 386, 486 and the Intel Inside Logo are trademarks of Intel Corporation. MS-DOS and Windows are trademarks of Microsoft Corporation. ©1991, Everex Systems, Inc.

CIRCLE 107 ON READER SERVICE CARD

New FROM NIKON

When we introduced our first desktop scanner, we set a standard by which all others are judged. Now, with the new Nikon LS-3510AF, we've managed to set an even higher standard by bringing you a better, faster 35mm scanner. For less.

Better control. First we improved color scanning capability. The new LS-3510AF offers you the option of either standard 8-bit or true 12-bit scanning for even greater color resolution.

Next, we added Autofocus which automatically provides the sharpest image for each scan regardless of the type of mount used. The scanner also adapts to a wider range of film processing variables and "learns" about each manufacturer's

film as it's first scanned. Then it automatically corrects for gamma and color balance and stores all that information in its memory. A feature available only from Nikon.

Faster scans. With the LS-3510AF, you can complete an 8.3MB (2048 x 1365 pixels) scan suitable for full page, 133 line screen reproduction including Autofocus and other corrections in under 110 seconds.

New SCSI Interface. A SCSI interface is now available for direct connection to a variety of desktop computers and workstations.

Automatic Operation. For high volume scanning requiring unattended operation, an optional Auto-feeder is available. It can scan up to 300 slides unattended.

Lower price. Faster scanning. Optional 12-bit operation. Your choice of GPIB or SCSI interfaces. A complete selection of film holders including ones for free-rotation and strip film. At a new, lower price. Nikon. Our standards are hard to beat.

For more information, write or call: Nikon Electronic Imaging, Dept. B2, 101 Cleveland Avenue, Bayshore, NY 11706.

(516) 547-4355. Or call 1-800-52-NIKON for the nearest dealer.



Bundled with PhotoStyler for Windows 3.0 applications, Photoshop or ColorStudio for MAC applications.

THE LS-3510AF SCANNER. A HIGHER STANDARD OF QUALITY, SPEED AND ECONOMY.



Nikon®

ELECTRONIC IMAGING

r e c r e a t i v i t y

PhotoStyler, Windows, Photoshop, ColorStudio, Macintosh are trademarks of their respective companies.

©1991 Nikon, Inc.

CIRCLE 329 ON READER SERVICE CARD

ticular virus repeatedly, this option will prove to be useful.

CRYPTOGRAPHIC CHECKSUMS

CHKVIRUS calculates signatures by creating a cryptographic checksum. This is the most effective checksumming method, but *Toolkit*'s basic algorithms aren't optimally secure. Still, it is one step in the right direction and better than the ineffectual simple checksumming or occasionally effective CRC checking of many other packages. With luck, future versions of this otherwise excellent package will be strengthened by a more sturdy cryptographic checksumming algorithm.

FINDVIRUS, the most important program in *Toolkit*, is a virus-specific scanner that is updated on a regular basis. On PC Labs' tests, FINDVIRUS was able to detect the Cascade, Dark Avenger, 4096, Stealth, and Joshi viruses. It wasn't able to detect the Red Cross virus.

Toolkit removed all the viruses it detected with the exception of Joshi. Many antiviral packages look for one virus signature at a time. Even if you have more than one virus, these programs will only recognize one. During the testing, *Toolkit* detected all viruses in a single sweep. Ontrack even distributes the program on notchless floppy disks, making any intentional or unintentional writing impossible.

Documentation has an excellent introduction to virus infection and the mode of infection. There's also a discussion of individual viruses, and prevention, detection, and removal strategies. For medium-

risk situations, you can opt for a \$130 quarterly upgrade or \$390 monthly upgrades for the first year. Each subsequent year costs \$80 or \$240, respectively. Since *Dr. Solomon's Anti-Virus Toolkit* includes a virus-specific scanner, its continual success depends on its frequent, reasonably priced upgradability.

Flu Shot Plus

by Greg Pastrick

The best evidence that Software Concepts Design's *Flu Shot Plus* is past its prime is the existence of *Virex-PC*, Version 1.1a, a greatly enhanced version of this shareware program developed by Ross Greenberg and distributed by Microcom (reviewed separately). Even so, *Flu Shot Plus* is still the best shareware antivirus protection for under \$20 (\$19, to be exact).

Its primary elements consist of a TSR called the FSP program, the all-important ASCII-editable *Flu Shot Plus* data file, and an invaluable 40-page documentation file that details program use. An additional utility called *Flu_Poke* protects and disguises the *Flu Shot Plus* data file. There's also a stripped-down version of the same scanner found in *Virex-PC*, here named *Virx*, which effectively detected and removed most known viruses on PC Magazine Labs' tests.

PROTECTION SETUP

By modifying the contents of the *Flu Shot Plus* data file, you can set up maximum protection against viruses. Here, you issue single-character commands to specific files and wildcard file specs in order to checksum files (C), read and write-protect files (R and P), exclude files (E), and allow operation of legitimate TSRs without hindrance (T).

For checksumming each of the critical executable program files, a dummy value is initially entered after the name of the file to be checksummed. For example:

C=C:\COMMAND.COM [72254])

PC FACT FILE

Flu Shot Plus, Version 1.82

Software Concepts Design, 594 Third Ave., New York, NY 10016; 212-889-6431 (BBS: 212-889-6438).

List Price: \$19 as shareware.

Requires: 256K RAM, DOS 2.0 or later.

In Short: *Flu Shot Plus* is a tried and true shareware program that offers good antivirus security. Its manual installation, configuration, and interface are past their prime, but for the price they're acceptable. For a fuller, enhanced, more-streamlined version, check out *Virex-PC*, which was developed by the same programmer.

CIRCLE 401 ON READER SERVICE CARD

On loading the TSR, the false checksum number triggers an alert that gives you the correct value for each file being checksummed.

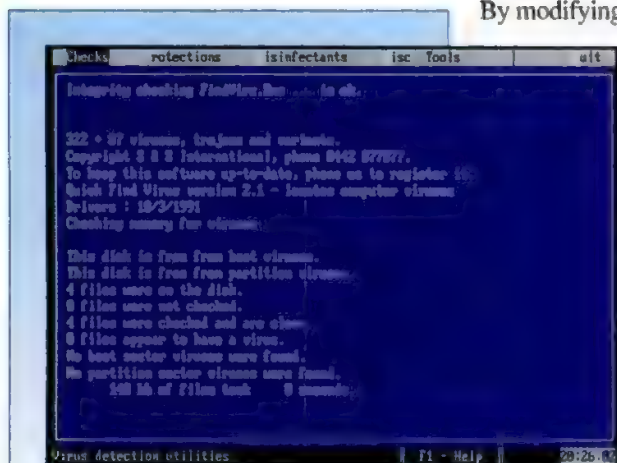
You record the values and reedit the data file by inserting the appropriate checksum values. The current version of *Flu Shot Plus* includes some additional command characters for checksumming and protecting the boot sector (B) and allowing uninterrupted operation of trusted programs (X). In *Virex-PC*, the functions of the data file are automated.

Not surprisingly, the TSR's interface is similar to that of *Virex-PC*. In both programs, the same activity indicators appear in the upper-right corner of the screen (+ and -). Warning boxes and alert messages provide options to continue with program access or to abort the questionable activity. In addition, the program always displays an alert message when an unauthorized program attempts to go memory-resident.

UP TO THE TASK

Flu Shot Plus's performance on PC Labs' tests proved that it is up to the task of preventing a good number of system infections. The TSR failed only in effectively blocking the Stealth and Joshi viruses from invading our test system. The *Virex* scan utility was mostly effective in detecting and removing infected files, except when it failed to remove the Totally Hidden Virus and the Joshi virus.

This shareware program is available in two forms: on floppy disk directly from Software Concepts and in downloadable compressed-file format on many BBSs including PC MagNet. Technical support



Dr. Solomon's Anti-Virus Toolkit includes an easy-to-use front end that makes accessing the different bundled utilities a snap.

SOFTWARE

ANTIVIRUS SOFTWARE



ANTIVIRUS SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	Flu_Shot Plus	Virus Guard	Viruscan	Data Physician Plus	VirusCide	Virus-Pro
List price	\$19.00	\$24.95	\$25.00	\$49.00	\$49.00	\$50.00
OPERATIONAL FEATURES						
Method of detection and prevention:						
Checksum	☒	☒	☒	☒	☐	☒
CRC (cyclic redundancy checking)	☒	☐	☒	☒	☐	☐
Proprietary (non-CRC)	☒	☐	☒	☒	☒	☒
Method of checking employed:						
File	☒	☒	☒	☒	☒	☐
Directory	☒	☐	☒	☒	☒	☐
Logical drive	☒	☐	☒	☒	☒	☒
Checking method may be uninstalled	☒	☒	☒	☒	☒	☒
Requires list of directories and files before using	☒	☐	☐	☐	☐	☐
Operates at boot-up	☒	☒	☒	☒	☒	☒
Offers password protection	☐	☐	☐	☒	☐	☐
Maintains operational log	☐	☐	☒	☒	☒	☒
PROTECTION FEATURES						
Uses signature methodology	☒	☒	☒	☒	☒	☐
Uses encrypted checksum	☒	☒	☒	☐	☐	☐
Other checking methods employed	None	None	Attributes, date, size, time	Attributes, date, location, size, time	None	Attributes, date, location, size, time
Monitors DOS interrupts	☒	☐	☐	☒	☐	☐
Monitors interrupt vector table	☐	☐	☒	☒	☐	☐
Monitors memory above 640K	☐	☐	☒	☒	☐	☐
Employs multiple protection levels	☒	☐	☒	☒	☐	☐
Protects boot sector	☒	☒	☒	☒	☐	☐
Protects COMMAND.COM	☒	☒	☒	☒	☐	☐
Protects hidden system files	☒	☒	☒	☒	☐	☐
Protects file allocation table (FAT)	☒	☐	☒	☒	☐	☐
Protects partition table	☒	☐	☒	☒	☐	☐
Protects nonexecutable files (.SYS, overlays)	☒	☒	☒	☒	☐	☐
Protects RAM	☒	☐	☒	☒	☐	☐
Protects drives beyond C:	☒	☒	☒	☒	☐	☐
Restores CMOS	☐	☐	☐	☐	☐	☐
Maximum number of logical drives	Unlimited	Unlimited	22	Unlimited	N/A	N/A
Maximum number of physical drives	Unlimited	Unlimited	7	Unlimited	N/A	N/A
Program comes on write-protected floppy disks	☒	☒	☒	☒	☒	☐
DETECTION FEATURES						
Detects virus at boot-up	☒	☒	☒	☒	☒	☒
Detects on demand	☒	☐	☒	☒	☒	☒
Detects before program execution	☒	☒	☒	☒	☐	☐
Notifies user of TSR program	☒	☐	☐	☒	☐	☐
Flags new programs	☐	☒	☒	☒	☐	☒
Flags programs with changed signatures	☒	☒	☒	☒	☐	☒
Scans conventional memory	☒	☐	☒	☒	☒	☐
Scans memory above 640K	☐	☐	☒	☐	☒	☐
Uses integrity statistics	☒	☐	☒	☒	☐	☐
Uses write traps	☒	☐	☐	☒	☐	☐
Uses read traps	☒	☐	☒	☒	☐	☐
Uses program integrity checks	☒	☒	☒	☒	☐	☒
Uses critical-area integrity checks	☒	☐	☒	☒	☐	☐
PROGRAM SUPPORT						
Update subscription available	☒	☐	☒	☒	☒	☐
Frequency and price of updates	Quarterly (\$10 each)	N/A	Quarterly (free with site license)	Quarterly (\$30 each)	Quarterly (\$12 each)	N/A
Method of updating	BBS	N/A	BBS, CompuServe, mail	BBS, mail	Mail	N/A
Network version available	☒	☐	☒	☒	☒	☒
List price	\$19.00	N/A	Negotiable	\$49.00	\$49.00	\$300.00

—Editors' Choice ☒ —Yes ☐ —No

N/A—Not applicable: The product does not have this feature.

SOFTWARE ANTIVIRUS SOFTWARE

SafeWord Virus-Safe	Virus Secure for Windows	Mace Vaccine	VirusSafe	AntiVirus Plus	Vaccine	VirusCure Plus	Central Point Anti-Virus	The Norton AntiVirus
\$62.50	\$95.00	\$99.00	\$99.00	\$99.95	\$99.95	\$99.95	\$129.00	\$129.95
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐							

THE DOS THAT SPACE... AND INTRODUCING

Free up more memory for your applications. Double your hard disk capacity. And send productivity soaring.

DR DOS 6.0 is here. A major upgrade to the award-winning DR DOS 5.0, this is the most advanced DOS operating system – engineered to help you conquer the limitations of your PC's memory and hard disk space. Fully DOS compatible, with free product lifetime support, DR DOS 6.0 is the best thing that ever happened to DOS – backed by a 60-day money-back guarantee.

Give your applications more running room.

DR DOS 6.0 maximizes memory space, so

you can run even the biggest DOS and Windows applications, and keep networked PCs humming. It automatically loads itself into upper and high memory – along with buffers, device drivers, TSRs, and network drivers – leaving more conventional memory free. It's ideal for i386 and i486-based machines, and delivers far more memory than the competition on 8086/88s and 80286s.

Don't get a new hard drive. Just get a new DOS.

Technologies like Windows make hard disk capacity and speed more important than ever. DR DOS 6.0 includes optional dynamic file compression, a space saver that can literally double your hard disk storage space – so a 40MB hard disk can hold 80MB of data! You also get

one of the fastest disk caches available for dramatically improved performance. Plus a disk defragmentation utility for speedier data access.

	MS DOS 3.X	MS 5.0 UPGRADE	DR DOS 6.0
FULLY DOS-COMPATIBLE	■	■	■
MAXIMUM MEMORY ON i386 & i486 PCs	575k	621k	627k
MAXIMUM MEMORY ON 80286 PCs	575k	621k	628k
MAXIMUM MEMORY ON 8086/88 PCs	588k	578k	612k
DOUBLE THE STORAGE CAPACITY OF TYPICAL HARD DISK			■
READ & WRITE HIGH-PERFORMANCE DISK CACHE			■
DISK DEFRAGMENTATION			■
COMPREHENSIVE PASSWORD SECURITY SYSTEM			■
UNDELETE		■	■*
TASK SWITCHING (NO. OF TASKS)		14	20
FAST TASK SWITCHING VIA COMMAND LINE OR GRAPHICAL SHELL USING EXPANDED/EXTENDED MEMORY			■
CUT & PASTE BETWEEN TASKS			■
ON-LINE DOCUMENTATION & HELP			■
PC-TO-PC FILE TRANSFER			■
FREE PRODUCT LIFETIME SUPPORT			■
FULLY BOOTABLE	■		■

* EVEN AFTER INTENSIVE DISK USE

D

R

D

O

CONQUERS
BEYOND.
DR DOS 6.0



SOFTWARE

ANTIVIRUS SOFTWARE

ANTIVIRUS SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

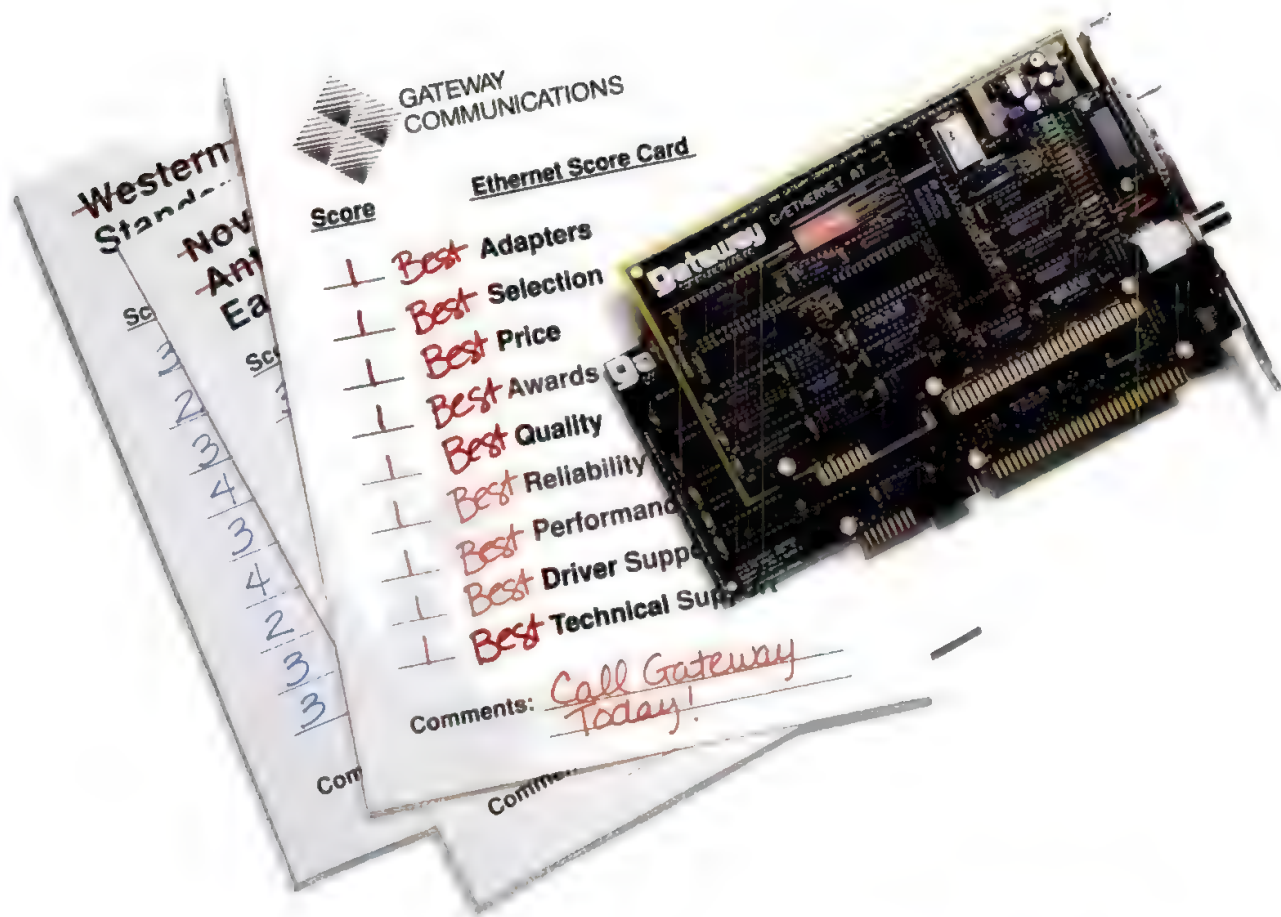
	Virax-PC	Dr. Solomon's Anti-Virus Toolkit	Vi-Spy	Certus	Panda Pro (for 50 copies)
List price	\$129.95	\$149.95	\$149.95	\$189.00	\$500.00
OPERATIONAL FEATURES					
Method of detection and prevention:					
Checksum	☒	☒	☒	☒	☒
CRC (cyclic redundancy checking)	☐	☐	☐	☒	☒
Proprietary (non-CRC)	☐	☒	☒	☒	☒
Method of checking employed:					
File	☒	☒	☒	☒	☒
Directory	☒	☒	☒	☒	☒
Logical drive	☒	☒	☒	☒	☒
Checking method may be uninstalled	☒	☐	☒	☒	☒
Requires list of directories and files before using	☒	☒	☐	☐	☐
Operates at boot-up	☒	☒	☒	☒	☒
Offers password protection	☒	☒	☐	☒	☒
Maintains operational log	☒	☒	☐	☒	☒
PROTECTION FEATURES					
Uses signature methodology	☒	☐	☒	☒	☒
Uses encrypted checksum	☐	☐	☒	☒	☒
Other checking methods employed	Location	Date, size, time	Size	Attributes, date, size, time	Proprietary
Monitors DOS interrupts	☒	☒	☐	☒	☒
Monitors interrupt vector table	☐	☒	☐	☒	☒
Monitors memory above 640K	☒	☐	☒	☒	☒
Employs multiple protection levels	☒	☐	☒	☒	☒
Protects boot sector	☒	☒	☒	☒	☒
Protects COMMAND.COM	☒	☒	☒	☒	☒
Protects hidden system files	☒	☒	☐	☒	☒
Protects file allocation table (FAT)	☒	☒	☐	☒	☒
Protects partition table	☒	☒	☐	☒	☒
Protects nonexecutable files (.SYS, overlays)	☒	☒	☐	☒	☒
Protects RAM	☒	☐	☐	☒	☒
Protects drives beyond C:	☒	☒	☒	☒	☒
Restores CMOS	☐	☐	☐	☒	☐
Maximum number of logical drives	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Maximum number of physical drives	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Program comes on write-protected floppy disks	☒	☒	☒	☒	☒
DETECTION FEATURES					
Detects virus at boot-up	☒	☒	☒	☒	☒
Detects on demand	☒	☒	☒	☒	☒
Detects before program execution	☒	☒	☒	☒	☒
Notifies user of TSR program	☒	☐	☒	☐	☒
Flags new programs	☒	☐	☐	☒	☒
Flags programs with changed signatures	☒	☒	☒	☒	☒
Scans conventional memory	☒	☒	☒	☒	☒
Scans memory above 640K	☐	☐	☐	☒	☒
Uses integrity statistics	☐	☒	☐	☒	☒
Uses write traps	☒	☒	☐	☒	☒
Uses read traps	☐	☒	☐	☒	☒
Uses program integrity checks	☒	☒	☒	☒	☒
Uses critical-area integrity checks	☐	☒	☒	☒	☒
PROGRAM SUPPORT					
Update subscription available	☒	☒	☒	☒	☒
Frequency and price of updates	Quarterly (\$95/year)	Quarterly (1 year \$130; then \$80/year)	Quarterly (1 year free; then \$149.95 each)	Quarterly (\$35/year; free monthly BBS updates)	Monthly (1 year free; then \$100/year)
Method of updating	Mail	Mail	Mail	BBS, mail	BBS
Network version available	☐	☒	☒	☒	☐
List price	N/A	\$149.95	\$149.95	\$1,395.00	N/A

☒—Editors' Choice ☒—Yes ☐—No

N/A—Not applicable: The product does not have this feature.

ENDS

If You Want The Best Ethernet Adapters, Your Choice Is Clear.



Most companies make an average Ethernet adapter. But, for superior quality, reliability, and performance, all you have to do is choose Gateway.

Our award-winning G/Ethernet and G/Ether-Twist LAN adapters give you the widest selection of adapters, the most complete line of operating system drivers, and more. All at the best price.

So choose Gateway, and get the best value for your networking dollar.

Gateway
communications, inc.

2941 Alton Ave. • Irvine, CA 92714
(714) 553-1555 • (800) 367-6555



All trademarks are of their respective manufacturers.

This is your dot matrix,
printing



This is our new quiet 2624,
printing



This is the one you've been waiting for. Panasonic® presents the first of a new generation of quiet dot matrix printers.

The KX-P2624 wide-carriage.

It doesn't scream, it whispers. Through multi-part forms, those 'industrial strength' spreadsheets, and your customer correspondence. And does them all with ease, speed and the superb reliability we've built a reputation on. It has all the features you've come to expect from the leader in dot matrix printing. And then some. One super letter-quality and seven letter-quality fonts. Multiple paper paths. An LCD display. A top speed of 300 cps in draft mode, 100 cps in letter quality. A two-year limited warranty on parts and labor.* And serene quiet.

For more information call us toll-free: 1-800-742-8086. Or, better yet, see your Panasonic dealer.

You'll like what you don't hear.



*Printers, Computers, Peripherals,
Copiers, Typewriters & Facsimiles*

Panasonic
Office Automation 

SOFTWARE ANTIVIRUS SOFTWARE

is available directly from Software Concepts. Greenberg can also be reached on the RamNet BBS or by MCI, BIX, and CompuServe. Site licenses are approximately \$15 per user. The manual includes an extensive schedule of costs.

Version 1.83 shipped too late to be evaluated here but is the version you should request. For the protection you get for the price, *Flu Shot Plus* is a great deal. If you want a slick interface, spend the extra money for *Virex-PC*.

Mace Vaccine

by Jim Quraishi

Fifth Generation Systems' \$99 *Mace Vaccine*, Version 3.0, is suitable for low-risk virus situations. A few years back, when Trojan horses dominated the scene, *Mace Vaccine* was an effective antidote, but in the daunting era of self-modifying Stealth and armored viruses, *Mace Vaccine*'s approach is showing signs of age.

Mace Vaccine does not recognize any viruses by name. Once installed, it detects whether a virus or a pseudo-virus has infected a program and changed its size. It also guards critical sectors, system files, COMMAND.COM, and write attempts that bypass DOS.

The program has two components: Survey and Vaccine. Vaccine is a 6K TSR that works on three levels. To work at the third level, it needs Survey, which creates

a master file by calculating a CRC checksum of all the executable files on the selected disk based on its size. *Mace Vaccine* will then examine each program's signature before it executes. If there is a change in the program, it will intervene and notify you of its change.

A GENERIC APPROACH

Mace Vaccine is not really a vaccine, since it cannot vaccinate different programs. It is primarily a checksum comparer with some generic monitoring capabilities. Since it doesn't really know the identity of any virus, it can't tell the difference between friend and foe. At its highest level of protection, it will just warn you that a new program has not been registered.

In testing, *Mace Vaccine* warned us when we tried to run any of the seven viruses because they had not been registered. Once we allowed the viruses to run, the program gave a few generic warnings about write accesses, but an average user would not be able to tell the difference between a legitimate write access and a viral write.

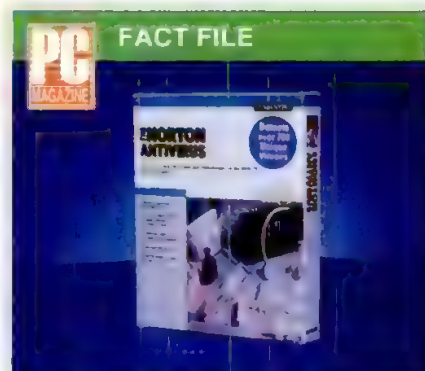
The software did detect changes in the size of infected programs, so you could remove these applications and restore them using your backups. Since *Mace Vaccine* offers generic protection, it is not updated frequently. Using this first-generation antiviral utility to fight fourth-generation viruses is not advisable.

The Norton AntiVirus

by Greg Pastrick

Symantec Corp.'s *Norton AntiVirus* is a comprehensive \$129.95 utility loaded with options for detecting, identifying, and repairing damage from virus activity. The program has notable strengths, from its smart and sophisticated Norton interface, with support for *Microsoft Windows* and mouse input, to its ability to add definition fields to its virus database. There are some flaws, but overall it is an extremely competent package.

The Norton AntiVirus, Version 1.5, has two interactive components: the TSR Virus Intercept and the Virus Clinic. When the TSR and scan module are configured for maximum protection, you pay a penalty in memory overhead and hidden sys-



The Norton AntiVirus, Version 1.5
Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 800-441-7234, 408-252-3570.
List Price: \$129.95.
Requires: 384K RAM, DOS 2.0 or later.
In Short: *The Norton AntiVirus* is a comprehensive, full-featured, and easily configurable antivirus program. The familiar Norton interface, which includes *Microsoft Windows* and mouse input support, is a big plus, but you pay a penalty in memory and disk space with the program's TSR and multiple hidden "intelligent checksum" file creation.

CIRCLE 403 ON READER SERVICE CARD

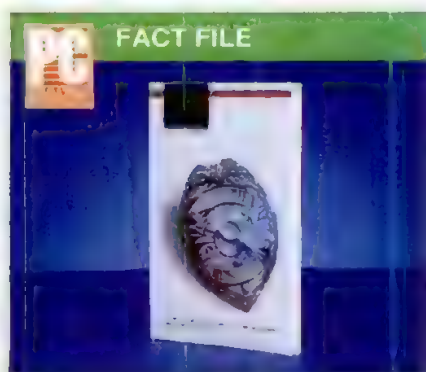
tem files or "inoculated files" that are ostensibly protected against viral attack. Due to the varying levels of protection, it's possible to get away with devoting as little as 1K RAM to virus monitoring. The next step up takes 15K, and the top level takes 32K.

SIREN ALERT

The Norton AntiVirus uses a method for checking the integrity of protected files that Symantec calls intelligent checksumming. With the TSR automatically loaded from boot-up, an alert box, complete with a siren, pops up on first contact with all unprotected executable, system, driver, and overlay files. There are three courses of action: proceed with file access, inoculate the file, or halt access. When inoculated, a 77-byte hidden check file is created under a filename different from the original. A system peppered with 77-byte files is an annoyance if you keep a tight account of disk space, but that's the price you pay for protecting important files.

The alert box also pops up when an infected or potentially infected file is detected either on the system or on a floppy disk. If a suspect file is infected by a known virus strain, it is named. If not, it is labeled as unknown, and you have the option to proceed or cancel access.

Following detection, you invoke Virus Clinic to perform a complete scan of the



Mace Vaccine, Version 3.0
Fifth Generation Systems, 10049 N. Reiger Rd., Baton Rouge, LA 70809; 800-766-7283, 504-291-7221.
List Price: \$99.
Requires: 512K RAM, DOS 2.0 or later.
In Short: As a generic virus monitor, *Mace Vaccine* can't identify viruses by name, though it will alert you when any program files have been altered. The program is not effective against stealth viruses.

CIRCLE 402 ON READER SERVICE CARD



We will beat any advertised price for comparable system configurations!*

- ▼ Free on-site service by Texas Instruments**
- ▼ Free 1-800 technical support
- ▼ Ready-to-ship configurations available
- ▼ 30-day "no questions asked" return policy
- ▼ Custom configurations with the hard drive, video and name-brand peripherals of your choice
- ▼ Corporate credit terms available
- ▼ Volume purchase agreements
- ▼ Pre-loaded MS-DOS 5.0
- ▼ **Compudyne systems are also sold retail exclusively through CompUSA, the Computer SuperstoreSM.**

386SX/16

VGA Color, 40 MB

\$999

- 1 MB RAM
- 40 MB IDE HD
- 1.2 MB FD
- 16-bit SVGA card
- 14" 640 x 480 VGA color monitor
- 1 par., 2 ser. ports
- 101 keyboard

Business Leasing payments as low as \$38 per month.*

386SX/20

Super VGA, 80 MB

\$1499

- 2 MB RAM
- 80 MB IDE HD
- 1.2 and 1.44 MB FDs
- 16-bit SVGA w/1 MB
- 14" 1024 x 768 Super VGA color monitor
- 1 par., 2 ser. ports
- 101 keyboard

Business Leasing payments as low as \$56 per month.*

386DX/25

Super VGA, 80 MB

\$1699

- 2 MB RAM***
- 80 MB IDE HD
- 1.2 and 1.44 MB FDs
- 16-bit SVGA w/1 MB
- 14" 1024 x 768 Super VGA color monitor
- 1 par., 2 ser. ports
- 101 keyboard

***Add \$100 for 32 K CPU Cache

Business Leasing payments as low as \$64 per month.*

386DX/25

Super VGA, 120 MB

\$1889

- 4 MB RAM***
- 120 MB IDE HD
- 1.2 and 1.44 MB FDs
- 16-bit SVGA w/1 MB
- 14" 1024 x 768 Super VGA Non-interlaced color monitor
- 1 par., 2 ser. ports
- 101 keyboard

Business Leasing payments as low as \$71 per month.*

Compare our prices to Gateway 2000, ZEOS and others. We will always be lower...Guaranteed!



**386DX/33 Cache
Super VGA, 120 MB
\$2099**

- 4 MB RAM, 32 K Cache
- 120 MB IDE HD
- 1.2 and 1.44 MB FDs
- 16-bit SVGA w/1 MB
- 14" 1024 x 768 Super VGA Non-interlaced color monitor
- 1 par., 2 ser. ports
- 101 keyboard

Business Leasing payments as low as \$79 per month.*

**486DX/33 Cache
Super VGA, 120 MB
\$2499**

- 4 MB RAM, 128 K Cache
- 120 MB IDE HD
- 1.2 and 1.44 MB FDs
- 16-bit SVGA w/1 MB
- 14" 1024 x 768 Super VGA Non-interlaced color monitor
- 1 par., 2 ser. ports
- 101 keyboard

Business Leasing payments as low as \$93 per month.*

**386SX/20 Notebook
VGA Mono, 40 MB
\$1879**

- 2 MB RAM (Max to 16 MB)
- 40 MB, 17 ms IDE HD (60 MB HD add \$100)
- 1.44 MB FD
- 9" VGA monitor w/32 greys
- 1 par., 2 ser., 1 monitor port
- External keyboard connector
- 6.5 lbs., 8.6" x 11" x 2.5"
- 3 hour battery pack

Business Leasing payments as low as \$71 per month.*

CompuDyne, Inc.
15151A Surveyor
Addison TX 75244
(214) 702-0055

Hours of Operation (CST)
Mon-Fri 8 am - 7 pm
Sat 9 am - 4 pm
(800) 932-2667

**Order Now
Toll Free**

1-800-932-COMP
24 Hour FAX Line (214) 702-0300



*If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock at the published price. Shipping and surcharges will be calculated. Special manufacturers' rebates may not apply. Competitor's system must meet or exceed all CompuDyne specifications to comply. All returns must be in "as new" condition, with original packaging, complete. Defective software exchanged for same item only. Prices and specifications subject to change without notice. **On-site service for customers located within a 100-mile radius of any TI service center. Notebooks excluded - replacement service only. †Leasing arranged through Leasing Group, Inc. Payments based on 36-month open-end lease.



PCM1011

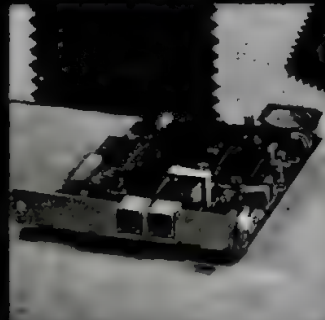


EPSON

Epson Equity LT286
12 MHz 286, 1 MB RAM, 40 MB
Removable HD, \$999
1.44 MB FD.

Laptops & Accessories

Canon BJ10e Printer.....\$289
Compudyne SX Notebook
20 MHz, 40 MB, DOS...\$1879
Citizen PN 48 Portable/Pro
Printer, weighs 2 lbs!....\$319
Leather Notebook Bag Combo
Briefcase & Carry-all.....\$129
Toshiba - all models!.....CALL



COMPUDYNE

Compudyne 2400i
2400 bps internal modem,
Hayes compatible, \$45
includes software.

Communications

ATI 2400e w/MNP5 Int....\$125
Compudyne 2400B Ext.....\$59
Complete Communicator...\$269
Answering Machine.....\$209
Intel SatisFAXion.....\$349
US Robotics 9600 baud
Dual Std. Int. Modem...\$699
Call on our complete LAN selection!



Panasonic

Panasonic KX-P1123
24-pin, 80-column, 240 cps
draft speed, 63 cps \$209
NLQ speed.

Printers

Epson LQ200.....\$209
EPL7000 Laser.....\$759
NEC 3200.....\$239
Okidata 400 Laser.....\$599
Panasonic KXP4420.....\$759
TI microLaser PS17
Postscript Laser.....\$1169



Lotus

1-2-3 for Windows
New! Exploits Windows with
icons, menus, more! \$379
Fully compatible!

Software - Business

Harvard Graphics 3.0.....\$359
Lotus 1-2-3 2.3.....\$309
Microsoft Excel 3.0.....\$279
Windows 3.0.....\$79
Word for Windows.....\$279
PageMaker 4.0.....\$455
Quicken 5.0.....\$39
WordPerfect 5.1.....\$229



NEC

NEC 3DS Monitor
14" multi-frequency VGA/color
.28 mm dp, 1024 x \$519
768, analog/TTL.

Monitors & Graphics

ATI VGA Wonder XL 1 MB...\$259
Compudyne
14" 640 x 480 VGA Cir...CALL
14" 1024 x 768, .39 dp
Super VGA Color....CALL
1024 VGA brd. w/512 K...\$85
Sony 1304.....\$549
TVM 5A 15" VGA, .26 dp...\$499



Seagate

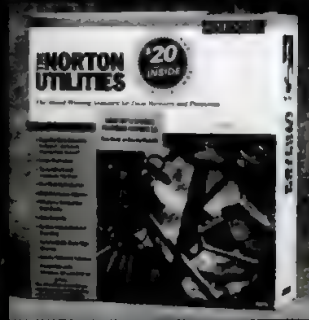
Seagate ST1102A
89 MB w/AT embedded
interface, 20 ms, \$279
3 1/2" form factor.

Hard Drives

Seagate IDE Drives
1144A 124 MB.....\$389
1239A 211 MB.....\$579
ST157A.....CALL
ST08 IDE Controller.....\$25
Plus HardCard 105XL.....\$499
Call for other makes & models!

Compudyne offers over 5000 products from all the top manufacturers!

ATI, Adobe, Aldus, Ashton-Tate, Canon, Central Point, Citizen, Complete PC, Compudyne, Epson, Hayes, Intel, Lotus, Magnavox, Maxtor, Micropolis, Microsoft, NEC, Okidata, Orchid, Panasonic, Paradise, Plus Development, Seagate, Seiko, Sigma, SMC, Software Publishing, Sony, Teac, TI, Toshiba, U.S. Robotics, Western Digital, WordPerfect, Zoom... and many, many more!



SYMANTEC

Norton Utilities 6.0
Safely recover lost data! Fully
compatible with \$102
MS-DOS 5.0!

Software - Utilities

386 Max.....\$65
Direct Access.....\$52
Fastback Plus.....\$99
MS-DOS 5.0 Upgrade.....\$55
Norton Antivirus.....\$78
Procomm Plus.....\$59
QEMM 386.....\$56
Over 2000 software titles available!

Compudyne, Inc.
15151A Surveyor
Addison TX 75244
(214) 702-0055

Hours of Operation (CST)
Mon-Fri 8 am - 7 pm
Sat 9 am - 4 pm
(800) 932-2667

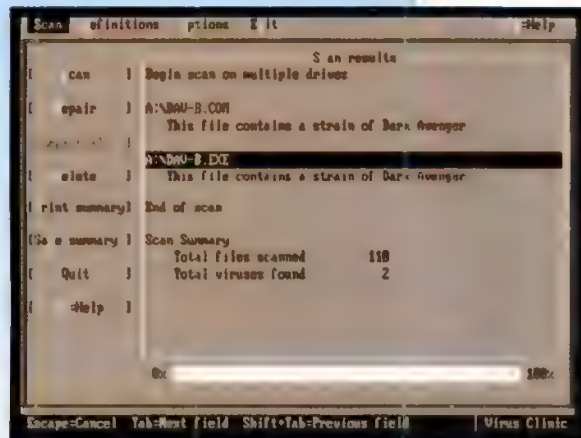
**Order Now
Toll Free**

1-800-932-COMP
24 Hour FAX Line (214) 702-0300

*If you find a current lower advertised price in this publication, we will beat that price, guaranteed! Competitor must have stock at the published price. Shipping and surcharges will be calculated. Special rebates may not apply. Must be exact item. Compudyne offers a 30-day "no-questions-asked" product return policy. All returns must be in "as new" condition, with original packaging, complete. Defective software exchanged for same item only. Prices and specifications subject to change without notice.



SOFTWARE ANTIVIRUS SOFTWARE



When *The Norton AntiVirus Virus Clinic* encounters a known virus, an alert is posted identifying the suspect files and the possible strain of virus infecting them.

disk, drive, or files, including inoculated files, and repair or remove any infected files. You can also use Virus Clinic before the TSR Virus Intercept has been loaded to complete a scan of all drives and files.

For maximum virus protection, *Norton* recommends you set the scan configuration at the advanced level to include all non-executable files. Once the intelligent checksum files have been created for all program files, the automatic checksumming feature may be disabled. Any new program files will trigger the Virus Intercept alert. When an inoculated file is suspected of infection, caution should be employed.

DETECTIVE WORK

On our tests, *Norton* performed ably in detection and prevention, but there were some notable exceptions. It failed to detect, remove, and prevent infection from the Red Cross virus, and although the program lists it as a known virus for which it offers protection, technical support at Symantec suspected that our virus was a mutation of the original strain.

The program was also unable to detect the presence of the Totally Hidden Virus, though it effectively prevented it from being introduced to the test system. Yet the program was ineffective in removing or preventing infection by the Joshi boot-sector virus, though it detected its presence and correctly identified the strain.

Version 1.5 of *The Norton AntiVirus*—

the first update since its release—is network-ready; it also includes password protection for all configuration settings, controls for scanning network drives, and a feature for creating and maintaining activity logs. Site licenses and volume purchase discounts are negotiable, and program updates are free to all registered users.

Considering the scope of its features and options, ease of installation, and sophisticated virus definition updating, *The Norton AntiVirus* gives good antivirus protection to single users and to network managers. What's missing is scan coverage for compressed files and an approach to checksumming that doesn't create so many hidden inoculation files.

Panda Pro

by Jim Quraishi

Panda Systems' *Panda Pro*, Version 1.1, is one of the most effective generic virus monitors, but it comes at a time when the new generations of viruses make non-virus-specific scanning impractical. The program includes generic monitors, MONITOR and TSRMON, and PHYSICAL, which generates and compares checksums of different programs. Panda Systems negotiates site licenses on an individual basis; you can purchase a minimum of 50 copies at a cost of \$10 per workstation.

DETECTING CORRUPTION

MONITOR is a 4K TSR that continually monitors Interrupt 13, which many viruses attack, but does not detect attacks on other interrupts. There's an impractical R switch that asks permission for each read activity and a more useful W switch that monitors write attempts. But you won't be able to distinguish a viral write attempt from a nonviral attempt.

TSRMON monitors INT21 and requires you to create a text file that lists approved TSRs. If any other program tries to stay resident, TSRMON will ask for your approval. However, there's a prob-

lem with both of these programs: If a Trojan horse or a virus hits an interrupt besides 13 or 21, you're out of luck.

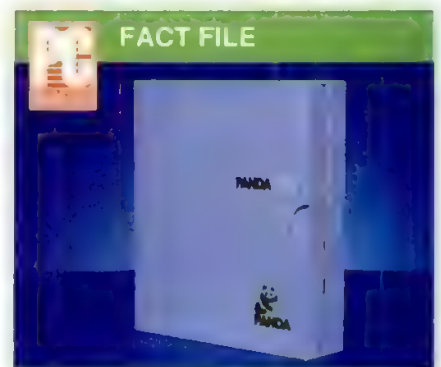
PHYSICAL takes signature snapshots of the partition sectors, boot sectors, system files, memory allocation, and hidden files. You can also take snapshots of files you want to protect, but you won't know if they're already corrupted.

When you invoke PHYSICAL, it takes a new snapshot of the files and compares them with the original signatures. If there's a discrepancy, it flags the file or sector as changed.

KNOW YOUR INTERRUPTS

Panda Pro did detect write attempts by Cascade, Dark Avenger, Red Cross, and PC Labs' Totally Hidden Virus without specifying the author of these write attempts. Since it flags all INT9 changes, you won't be able to distinguish a legal attempt from an illegal one. An average user would probably ignore these warnings and let the damage happen. The next time we ran PHYSICAL, *Panda Pro* flagged the file as bad since the checksum had changed. The program failed to prevent, detect, or remove the Joshi boot-sector virus.

The best thing to do with a corrupted file is to delete it. *Panda Pro*'s repair features can defang the virus but cannot remove it. Only a virus-specific scanner, which *Panda Pro* does not include, can provide true repair capabilities.



Panda Pro, Version 1.1

Panda Systems, 801 Wilson Rd., Wilmington, DE 19803; 800-727-2632, 302-764-4722.

List Price: Sold on an individually negotiated site license basis. Minimum of 50 copies, \$10 per workstation.

Requires: 256K RAM, DOS 2.0 or later.

In Short: *Panda Pro* is a good generic virus monitor with mediocre checksumming capabilities. It is not the best antivirus choice for high-risk situations.

CIRCLE 404 ON READER SERVICE CARD

SafeWord Virus-Safe

by John R. Quain

Using a combination of sophisticated verification techniques, Enigma Logic's *SafeWord Virus-Safe*, Version 1.12, is designed to detect system changes caused by a computer virus. This \$62.50 package is best used in a corporate setting rather than as a solution for individual users.

Once installed on a hard disk, *Virus-Safe* warns of every change made to protected files, whether or not a virus is responsible. During installation, it verifies DOS interrupts and DOS system files and can install itself in the AUTOEXEC.BAT or CONFIG.SYS file to invoke a 20K RAM TSR monitor.

Upon installation, the program does not automatically make verification files of executable files. Instead, every time a new .COM or .EXE file is run, for example, *Virus-Safe* asks you to create a verification file or abort the program. If you use many applications, these interruptions can be extremely distracting. An editing program attempts to solve the problem by allowing you to add several verification files at once, but the interface is clumsy and time-consuming, and the documentation provides little solace.

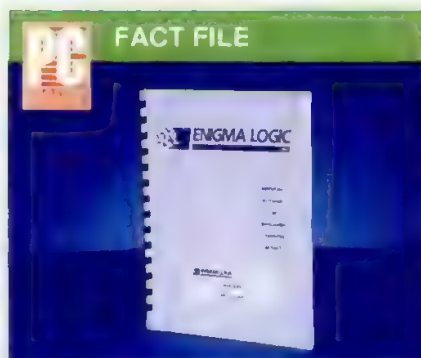
VERIFICATION METHODS

The virtues of *Virus-Safe* lie in its selection of verification methods, including Turbo, full CRC, Data Encryption Standard ANSI X9.9 (used by the U.S. government), and ISO 8731-2 (used principally in the banking industry). The Turbo method checks the first and last 512K of suspected files; the ANSI method provides the most security. You can also specify the percentage of a file to be checked and the frequency of checks—on boot-up, every time the file is loaded, or after a specified number of executions. *Virus-Safe* also checks hidden sectors and partition percentages on hard disks formatted with DOS 3.0 or later.

On PC Labs' tests, *Virus-Safe* detected the introduction of each new program. However, because *Virus-Safe* does not compare virus signature files, it only warns that a new program is about to be loaded. You can then choose to abort, continue, or write a new verification file. When we infected the test system's hard disk and rebooted the system, *Virus-Safe* located all infections except the Stealth virus.

One advantage of *Virus-Safe*'s ap-

SOFTWARE ANTIVIRUS SOFTWARE



SafeWord Virus-Safe, Version 1.12

Enigma Logic Inc., 2151 Salvio St., #301, Concord, CA 94520; 800-333-4416, 415-827-5707.

List Price: \$62.50; as shareware \$25; site license, \$3,900 (for 100 PCs).

Requires: 19K RAM, DOS 3.0 or later.

In Short: An advanced verification system for monitoring changes in your PC, *Virus-Safe* will give the average user little comfort: It won't prevent infection or restore files when damage occurs. The program is intended for the corporate user.

CIRCLE 405 ON READER SERVICE CARD

proach is that there is no need for continual upgrades of virus-identifying signature files. A shareware version of the program is available on several electronic bulletin boards. Registered users receive toll-free technical support, free upgrades for the first year, and a manual.

Banks, investment firms, and other corporate environments may appreciate *Virus-Safe*'s versatility and automatic audit trail creation. Individual users, however, will have difficulty with the program's alarms and awkward interface.

Vaccine

by Greg Pastrick

WorldWide Software's \$99.95 *Vaccine* takes on viruses with a squad of utilities that will separately scan, monitor, analyze disk images, impose drive write restrictions, and secure CMOS values. Version 3.3 provides sound protection against virus activity, but it lacks a cohesive interface. Operations are handled from the command line or from batch files with the addition of option switches; Version 4.0, which missed our testing deadline, unites the utilities in a mostly interactive DOS shell with mouse support.

Three utilities form the first line of defense: the TSR monitor Vaccine, the

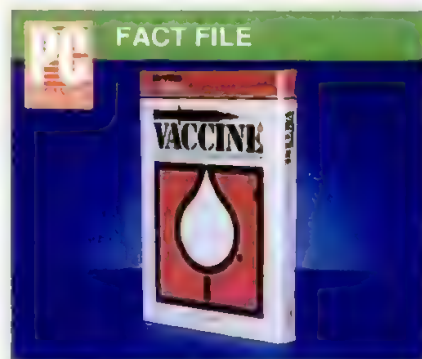
virus scanner Physical, and the checksum file creator and periodic analyzer Checkup. The Vaccine TSR keeps watch on DOS interrupts and warns of viral activity in the course of all read or write interrupt requests.

An essential part of *Vaccine*'s monitoring capabilities, the ASCII-editable authorized program file (APF) is a listing of all safe program files that is read into memory when the TSR is invoked. The program's simple notice box warns of suspected viral activity, names the suspected virus, and lets you continue with program access or reboot the system.

AGGRESSIVE PROTECTION

The scanning utility, Physical, is more aggressive in its protection of executable program files and more informative on the nature of viral activity. Referring to a list of known viruses, it is able to name the suspected virus, list potentially infected files, and remove infected files. For optimal scanning performance, you can add two parameter switches to the command line: one that enables a file erase option and another that checks all files in the path statement.

Analysis of system changes is provided by the Checkup utility. It records encoded checksums for all essential program files, or any switch-defined files, and keeps a log of altered or deleted files. The Xray utility offers backup and resto-



Vaccine, Version 3.3

WorldWide Software Inc., a subsidiary of the Davidsohn Group, 20 Exchange Place, 27th Fl., New York, NY 10005; 800-999-6031, 212-422-4100.

List Price: \$99.95.

Requires: 256K RAM, DOS 3.0 or later.

In Short: This collection of five utilities uses the toolkit approach to antivirus protection. It lacks a cohesive interface to tie its basically sound functions and features together. Skip this version and wait for *Vaccine*, Version 4.0, with the same utilities packaged under one interactive shell.

CIRCLE 406 ON READER SERVICE CARD

PRICE: The New PC Revolution!



More Radical

CompuAdd Presents New, Improved Designs



Reductions!

and Our Lowest Prices Ever!

"Price-conscious PC buyers have turned to clones,
and few regret the choice."

-PC World August 1991

The new PC revolution is all about price. At CompuAdd, we know that competitive prices and good values are the most important things we offer. We also know that the people who buy PCs find our competitors' high prices on new technology revolting! That's why at CompuAdd, we've dropped our prices on our most popular systems and introduced unbeatable low prices on our new improved designs, too.

CompuAdd has always led the way among PC compatibles when it comes to customer satisfaction and outstanding service. Now CompuAdd leads the way in pricing too! The people who buy PCs have toppled the old systems and turned to the marketplace for alternatives. CompuAdd is ready with new technology at revolutionary prices.

CompuAdd[®]

Customer driven, by design.

Call 800-456-3660

Design Evolution,

The New, Low Profile Chassis at



CompuAdd 316s

Reduced \$100

\$1295

CompuAdd 320sc

Reduced \$100

\$1695

CompuAdd 425

Reduced \$490

\$2995

Price Revolution!

the New, Low Profile Price!

Now get 386SX performance at the lowest possible price! Perfect for the small business, as a network station or as your home computing center — an all-round workhorse when it comes to Windows applications! Pick up the 316s loaded with Windows 3.0, now at an all-time low price!

Monitor and Hard Drive Options

	40MB	80MB
316s		
MGA	\$1295	\$1495
High-Resolution VGA	\$1595	\$1795

The most expandable 386 20MHz system you can buy! The 320sc's unique motherboard holds 32KB built-in cache memory to speed up data access, while the Hi-Res VGA controller, also built in to the motherboard, delivers incomparable video!

Monitor and Hard Drive Options

	40MB	80MB
320sc		
MGA	\$1695	\$1895
High-Resolution VGA	\$1995	\$2195

The 425 is 40% faster than a 386 system running at the same clock speed — no wonder *PC Magazine* called the CompuAdd 425 a "pocket rocket." Now with the new stretch chassis, it's expandable, too. You'll get significant performance gains in computation-intensive and multitasking applications, now at an unbelievably low price!

Monitor and Hard Drive Options

	80MB	120MB
425		
MGA	\$2995	\$3095
High-Resolution VGA	\$3295	\$3395

Our new stretch chassis gives you expandability in a low profile, small footprint design! It's roomy enough for two internal 3.5" hard drives plus two accessible 5.25" drive bays — allowing you an extra 5.25" floppy drive, CD ROM or a tape backup.

CompuAdd[®]
Customer driven, by design.

Call 800-456-3660

Low Prices Give

Power Users' Favorites, Now at



CompuAdd 325

Reduced \$250

\$1995

CompuAdd 333

Reduced \$300

\$2695

CompuAdd 433E

Reduced \$620

\$3995

People Power!

Substantial Reductions!

A true 32-bit 386 machine designed for power users. As a small business file server, a low-cost CAD machine or a multitasking workstation, it's unsurpassed. Built-in cache memory controller and hard drive options up to 200MB are available.

Monitor and Hard Drive Options

	40MB	80MB
325		
MGA	\$1995	\$2195
High-Resolution VGA	\$2295	\$2495

PC Magazine chose the 333 as a finalist in its Technical Excellence Awards. Two 16-bit expansion "hot slots" are provided for the HardCache/ESDI controller and Hi-Rez VGA graphics card. Plug them in for spectacular data transfer and video performance! The optional 640KB SRAM card puts DOS and DOS-based applications into true 0 wait-state memory.

Monitor and Hard Drive Options

	80MB	120MB
333		
MGA	\$2695	\$2795
High-Resolution VGA	\$2995	\$3095

The expanded 32-bit EISA bus lets you access any memory or peripheral device installed on the system — regardless of bus width! Use your old 16-bit peripheral cards alongside new 32-bit EISA cards with no compatibility problems. A "hot slot" for the Hi-REZ VGA controller and a specially designed optional cache module move your data through at lightning speed.

Monitor and Hard Drive Options

	80MB	120MB
433E		
MGA	\$3995	\$4095
High-Resolution VGA	\$4295	\$4395

These high-performance, low-cost desktop systems are designed to take on your toughest computing challenges. They pack enough power and punch to serve as CAD/CAM stations or network files servers. Now they're available at amazingly affordable prices that put vast computing power within everyone's reach.

CompuAdd[®]
Customer driven, by design.[™]

Call 800-456-3660

Less is More.

Less than 7 Pounds and Less than \$2000.



Our 316nx just got \$500 lighter! The CompuAdd 316nx doesn't sacrifice on performance either. It uses the Intel 16MHz 386SX microprocessor with a big 30MB standard hard drive and a 3.5" 1.44MB diskette drive.

When Your Desktop is an Airline Tray Table...

You'll appreciate the large well-spaced keys and backlit, monochrome VGA liquid crystal display. Hard to believe we got it all into an 11" x 8.5" x 2.1" notebook package, isn't it?

CompuAdd®

Customer driven, by design.

Call 800-456-3660

Hours: Monday-Friday 7:00am to 9:00pm CST; Saturday 9:00am to 5:00pm CST
12303 Technology Blvd. Austin, Texas 78727

© CompuAdd Corporation 1991. We accept MasterCard, VISA, Discover, money orders, certified checks (please allow ten days for processing), C.O.D.s (\$50 minimum order), company and institutional purchase orders (minimum initial purchase \$500, thereafter \$50), and wire transfers. Prices do not include shipping and handling. Please add appropriate local sales tax. Opened software, videotapes, other consumables and shipping costs are nonrefundable. All return items must be accompanied by a returned merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd is not liable for damage due to omissions or typographical errors.

ration of CMOS contents, and the Shelter utility locks all write attempts to any addressable drive.

HITS AND MISSES

PC Magazine Labs' tests of the Physical and Vaccine utilities uncovered some holes in Vaccine's antivirus coverage. Interestingly, the scan utility failed to detect the Stealth virus, which increases executable file sizes by 4,096 bytes. However, with the TSR loaded, the utility scored a qualified pass on virus prevention. It did not allow the virus to enter the system, but the program crashed and hung the system. The two utilities also failed to detect or prevent infection by the Joshi boot-sector virus. While the scanner scored a miss with the Totally Hidden Virus, the TSR's warning and reboot option successfully prevented the virus from infecting the system.

If Vaccine, Version 3.3, has the features and performance you need, the best advice is to pass it up for Version 4.0's shell interface. While not without its own problems, Version 4.0 lets you tag specific files and directories and promises improved logging and virus-identification features.

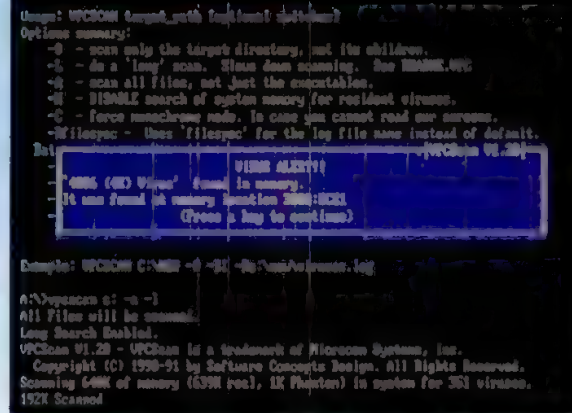
Virex-PC

by Greg Pastrick

Virex-PC is a \$129.95 collaboration between Microcom and Ross Greenberg, the author of *Flu_Shot Plus* (reviewed above), that succeeds in providing a high level of antivirus security. On PC Magazine Labs' antivirus tests, the program's TSR monitor was nearly flawless in blocking viruses from infecting our system and only slightly less successful in handling virus detection and removal. Virex-PC is an enhancement of Greenberg's shareware program coupled with a competent scanner. It automates many of the tasks you have to perform manually with *Flu_Shot Plus* and adds a sophisticated collection of repair features.

The software suffers from a tedious installation process, with multiple screens and redundant checks, but it covers all the settings, including options to edit the registered executable files in the checksum file list, to expand the list of write-protected files, to select from four levels of security, and to activate the action/response log.

SOFTWARE ANTIVIRUS SOFTWARE



Here, a total scan of a hard disk using the VPCscan module of Virex-PC turns up a known virus that attacks .COM files and alters memory by increasing file sizes by 4K.

System security is built around two modules: the 30K VirexPC TSR and the virus scanner, VPCscan, which also removes or repairs virus-damaged files. Like *Flu_Shot Plus*, Virex-PC calculates and compares checksum values created during installation from a user-definable listing of executable program files.

Don't be misled by the language of the initial TSR screen, which seemingly prompts you to toggle the Alt and Ctrl

keys three times to activate the program. In fact, toggling the Alt key deactivates the TSR, and toggling with the Ctrl key turns the display activity indicator on and off.

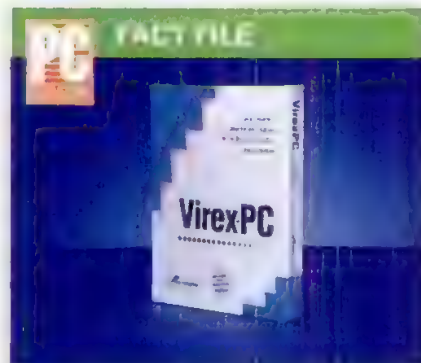
The program's interface takes a minimalist approach. The alert and warning displays are precise and contain the information needed to take appropriate action. When an unregistered program attempts to go memory-resident, you have the option to reboot or remove it. Similarly, the scanning module offers terse status reports as it efficiently screens memory, files, and directories. With command-line parameter switches you can instruct the scanner to eliminate or automatically disinfect attacked files.

EFFECTIVE PREVENTION

Virex-PC proved extremely effective at detecting and preventing most viruses, stumbling only on detection and removal of the Totally Hidden Virus and on removal and prevention of the Joshi boot-sector virus. It did identify the Joshi strain and stop the Totally Hidden Virus from infecting the system.

Microcom offers technical support via telephone and fax, as well as an update service for the annual fee of \$75. The service includes all program revisions for registered users and quarterly virus updates.

Based on its features and performance, Virex-PC is a good choice for securing systems against virus attacks. According to a Microcom representative, Version 2.0 promises to be a major upgrade and should be available now. If some of the rough edges of the installation are smoothed out, Virex-PC, Version 2.0, should be a real antivirus contender.



Virex-PC, Version 1.1a
Microcom Inc., P.O. Box 51489, Durham, NC 27717; 800-877-2873, 919-490-1277.
List Price: \$129.95.
Requires: 512K RAM, DOS 2.1 or later.
In Short: Virex-PC is an expanded version of the shareware *Flu_Shot Plus* coupled with a powerful scan and virus-removal program. The installation procedure is tedious and suffers from multiple, redundant screens, but a major upgrade should be available soon.

CIRCLE 407 ON READER SERVICE CARD

VirusCide

by Henry Fersko-Weiss

VirusCide, from Parsons Technology, is an easy-to-use scanning program that detects and removes over 500 viruses and their variants. The program is not ideal for high-risk environments, since it is not memory-resident and does not automati-

Gray Shades. New Wave.



Mouse Systems' PageBrush/256 grayscale scanner provides high-quality images for desktop publishing. Add the professional touch to your newsletters, flyers, corporate pieces, and office projects with the realism and depth this scanner provides. Bundled with grayscale processing and OCR software, the PageBrush/256 offers the complete desktop publishing solution: just add the computer and the printer! Get down to business and grab some gray shades with the PageBrush/256 scanner.

See your dealer or call 510-656-1117
for all the details.



Mouse Systems' PageBrush/Color adds cool and groovy hues to your projects. From radical reds to bodacious blues, the PageBrush/Color makes desktop presentations sizzle and sparkle. Bundled with awesome image processing and totally radical multi-media software, the PageBrush/Color lets you impress your friends and influence people in ways you never dreamed possible. Don't be a punk, buy this scanner!



Mouse Systems Corporation • 47505 Seabridge Drive, Fremont, California 94538 • 510-656-1117 • Fax: 510-656-4409

PageBrush and Sniffy the Mouse are trademarks of Mouse Systems Corporation. Groovy and cool are trademarks of the 1960's. Hip is a trademark of the 1970's. Radical, awesome and bodacious are trademarks of the 1980's. Other names are trademarks of their respective owners. And even if you are a punk, you can still buy a scanner, or any of Mouse Systems other great products.

CIRCLE 120 ON READER SERVICE CARD

SOFTWARE

ANTIVIRUS SOFTWARE



VirusCide, Version 2.01

Parsons Technology Inc., One Parsons Dr., P.O. Box 100, Hiawatha, IA 52233-0100; 800-223-6925, 319-395-9626.

List Price: \$49.

Requires: 256K RAM, DOS 2.1 or later.

In Short: *VirusCide* is a simple virus-scanning program that can only detect viruses it knows through distinctive signatures. It isn't memory-resident and can't automatically prevent infections. But it has a well-designed screen, uses pull-down menus, and is very easy to learn.

CIRCLE 406 ON READER SERVICE CARD

cally prevent infections. At a list price of \$49, though, *VirusCide*, Version 2.01, has a cost commensurate with its simple ambitions.

The program's pull-down menu interface enables you to save command options. Then, to run the program, you simply set the search path and press Enter. You can also use command-line switches at the DOS prompt to run *VirusCide* automatically.

The main program screen has three windows: The top window displays directory and filenames as they are checked; the middle window tells *VirusCide* where to search; the bottom window updates the number of .EXE, .COM, overlay files, and directories checked, indicates the number of infected files, and specifies the percentage of data infected. A command window pops up when a virus is detected.

NONRESIDENT APPROACH

VirusCide identifies viral infections by looking for virus signatures. Since it can't use checksums or CRC checking, it can only find viruses it knows about. This means your system is vulnerable to new viruses until Parsons updates the program.

Since the program isn't a TSR, you must be disciplined about using it. *VirusCide* will check your hard disk at boot-up if you place the appropriate statement in your AUTOEXEC.BAT, but you have to check each floppy disk manually before you use it to prevent known vi-

uses from infecting your system. For some users, there are advantages to the program's nonresident approach: It won't run into conflicts with other TSRs and won't drain precious memory from other programs.

Unless *VirusCide* is in automatic mode, it prompts you for directions every time it finds an infected file. You can continue searching, remove the virus from the file, get a description of the virus, or stop checking.

UNFAMILIAR STRAINS

VirusCide had some difficulty in detecting and removing PC Magazine Labs' test viruses, and it was unable to detect the

Red Cross virus. Although Red Cross is on the program's virus list, Parsons Technology says our test Red Cross was an unfamiliar strain. It was also unable to detect the Totally Hidden Virus and the Joshi virus, but the company says that subsequent versions, introduced too late for our testing, can detect and remove Joshi.

Individual users can buy quarterly updates for \$12 each. Corporations and government organizations pay \$9 for the first year of updates and \$12 for the following year. In the fast-moving world of viruses, quarterly updates may not be frequent enough if your system is at high risk. Parsons provides a technical support line and a forum on CompuServe.

WHY YOUR FAT NEEDS PROTECTION

by Winn L. Rosch

One of the most virus-prone parts of your hard disk is the file allocation table (FAT). Without an intact FAT, DOS will lose all but the first few paragraphs of every file it stores. A virus that alters the FAT can hopelessly jumble your hard disk files and prevent you from ever making sense of its contents again.

The FAT is essentially DOS's map of your hard disk. To make most efficient use of your disk's storage space, DOS breaks down the disk into units called clusters, each one typically holding 2,048 bytes (corresponding to four 512-byte sectors on your hard disk). A single file comprises a number of clusters, which need not be contiguous. The FAT map tells DOS which clusters form each file.

LINKING CLUSTERS

DOS ties the clusters of a file together by linking them. The directory entry on the disk includes a vital bit of information, the identifying number for the first cluster in the file. The FAT entry for that cluster holds the number for the next entry belonging to that file. Each FAT entry in turn points to the next entry, up to the last one. To read a file, DOS collects all the cluster numbers together from the FAT, reads the corresponding clusters, and sends the



information it finds in the clusters to your programs.

A virus can change the FAT entries intentionally or by accidentally overwriting them. In either case, the result is the same: FAT entries point to the wrong clusters, and the data in files becomes confused. Files can also end up cross-linked, with the FAT assigning the same clusters to multiple files. Or clusters can be lost, left apparently unassigned to any file. All your data is still on your disk, but you just can't access it.

Equally disheartening damage can occur if your partition table—the set of specifications that describes the division of your hard disk—gets corrupted. When the partition table is damaged, your PC will no longer recognize the partition information for your hard disk. In fact, it may not even recognize your disk as being a DOS device. To reclaim your hard disk you must reformat it, which inevitably destroys all of your data. The moral: Protect your FAT at all cost. ■

GRAPHIC ILLUSTRATION GARY W. KAPLOW

VirusCide does not protect your system from infection unless you manually test every disk, nor does it detect unknown viruses. If these two weaknesses don't bother you, then *VirusCide* is a capable, easy-to-use package at a reasonable price.

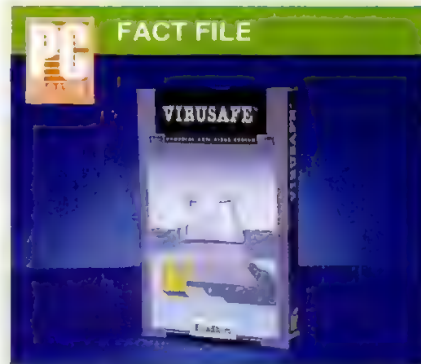
VirusSafe

by Jim Quraishi

Recently purchased by XTree Co., Elia-Shim Microcomputer's \$99 *VirusSafe*, Version 4.01, is a virus-specific scanner that detects and removes viruses by checking for viral signatures in executable and suspect files. It's scanning features are supplemented with rudimentary checksumming capabilities.

Before installation, *VirusSafe* checks the destination drive for any viruses and continues only if the coast is clear. If your computer is already infected, you may want to run a clean sweep with UNVIRUS to detect and remove known viruses.

SOFTWARE ANTIVIRUS SOFTWARE



VirusSafe, Version 4.01

XTree Co., 4330 Sante Fe Rd., San Luis Obispo, CA 93401; 800-477-1587, 805-541-0604.

List Price: \$99; network version, \$295. Yearly upgrade subscription, \$60.

Requires: 512K RAM, DOS 3.0 or later.

In Short: A good scanner adequate for most low to medium-risk situations, *VirusSafe*'s interface is quite approachable, but its checksumming capability is inadequate.

CIRCLE 409 ON READER SERVICE CARD

VSMENU is the front end that gives access to most of *VirusSafe*'s functionality. The screen is crowded but easy to use. Protection is provided through VS, a virus-specific scanner that installs itself as a TSR and can be run with a number of feature switches. If you like, *VirusSafe* will modify your AUTOEXEC.BAT so that virus scanning is performed on each boot. Its CRC checking is simple and inadequate for use by itself.

VIRUS MAIL-IN

PIC creates checksums of the marked files. *VirusSafe*'s memory-checking program, VC, lets files duplicate themselves to reveal any new viruses. If a new program is trying to duplicate illegally, it copies this program into a VIRUS.PGM file. You are then instructed to make a copy of this file and mail it to the vendor.

On PC Magazine Labs' tests, *VirusSafe* was able to prevent, detect, and remove the Cascade, Dark Avenger, and Stealth viruses. While it recognized the Red Cross virus, it wasn't able to remove that one.

COVERING YOUR BASES: Ways to Protect Data from Unauthorized Access

by Carol Levin

You may be running antivirus utilities diligently and following a strict backup routine, but your PC is still vulnerable to assault. Unauthorized users can boot up your machine and rummage freely through directories and files, or unsuspecting novices may experiment with unfamiliar utilities and reformat your hard disk. There are a wide range of software options available to help you restrict who can boot your computer and what they can do once they get inside.

The first generation of security packages were loaded from AUTOEXEC.BAT and were easily eluded by typing Ctrl-Break during boot-up or by booting from a floppy disk. Security packages are now more clever and come with a variety of options. With basic password protection, a disk-locking system, or a file encryption package that encodes your hard disk's file allocation table (see the sidebar "Why Your FAT Needs Protection"), you can stymie intruders, restrict access to

files, hide sensitive information displayed on an unattended PC, and even break up covert *Tetris* tournaments.

SECURITY YOU ALREADY HAVE

Your PC may already be equipped with some level of security. Some Compaq computers, for example, come installed with their own password protection utility. If you run DOS 5.0, you can add basic password protection to individual applications that are started from the shell program. Many menuing packages and applications such as *WordPerfect* and *Lotus 1-2-3* have encryption capabilities.

Some of the antivirus packages we tested also have the ability to control access to PC resources.

There are many standalone security options. *Access Control Software* (\$59) from Harcom Security (800-275-3438) provides basic boot-up protection (the hard disk remains off limits until the correct password is entered), and *PowerLock* (\$149.95) from Sentry Software (602-491-1383) goes a step fur-

ther with multilevel file protection. *Turboloc* (\$95) from g4 Software (800-486-9552) and *Vlock* (\$135) from Golden Bow Systems (800-284-3269) specialize in password security for shared PCs, providing customized application menus for approximately 30 users.

BOOT PROTECTION

Other packages that provide boot-up protection and control privileges to PC resources include *Security Guardian* (\$250) from Command Software Systems (800-423-9147) and *Secure It* (\$179) from Fresh Technology Group (800-545-8324). *Data Security Plus* (\$99.95) from PC Guardian (800-288-8126) secures both workstations and file servers. To secure the Microsoft Windows environment, *Lock* (\$49.95) from METZ Software (800-767-6292) implements password protection via hotkey functions after a period of inactivity or at a specified time of day.

CONTINUES

2400 BPS DATA MODEM BUYERS: LOOK FOR THE SENDEFAX™ SEAL.



If you've decided to buy a data modem to tap into information services and free bulletin boards, or move data between computers, be sure to look for the Sendfax seal on the package. With Sendfax, you'll get everything you want in a data modem, plus a *big* bonus. You'll be able to send faxes directly from your personal computer.

No more need to print hard copy first. No more trudging to the fax machine, waiting in line, or standing there feeding in paper.

If you only send faxes now and then, the silver Sendfax seal means you'll get all the advantages of instant, direct faxing on your data modem at little or no extra cost. If you're a frequent faxer, go for the gold. For a few dollars more, it's so fast (9600 bps) it can pay for itself the first few times you use it. By programming faxes to go at night rates, you'll save 40% or more on your phone bill. If you send a lot of long distance faxes, that adds up fast. And since modems don't wear out, it will add up for a long time.

Sendfax is available on the best quality data modems through your local computer retailer or direct mail marketer.



SIERRA SEMICONDUCTOR

2075 North Capitol Avenue, San Jose, California 95132

CIRCLE 740 ON READER SERVICE CARD

"I don't think we're in
Kansas anymore, Toto."

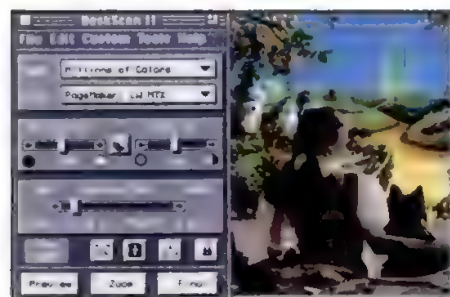


You'd be surprised where the new HP ScanJet IIc scanner can take you.

Our improved 8-bit grayscale brings you black & white that you once only dreamed of. And our new 24-bit color helps give your output magical impact. Both come with true 400 dpi quality.

Our new HP AccuPage technology combined with your OCR software makes text scanning better than ever. And with our automatic document feeder, you can scan up to 50 pages in quick succession.

When it comes to scanning color, the ScanJet IIc only



*The HP ScanJet IIc makes it easier
than ever to create a great image.*

The new HP ScanJet IIc
opens up a whole new world.
With better black & white.
And color.



needs to make one pass. So you scan color images faster than you can click your heels three times. Of course, the ScanJet IIc is compatible with all major software. And it's only \$2,195* for IBM AT-compatible and Micro Channel. Or only \$1,995* for Macintosh. For the nearest authorized HP

dealer or for more information, call 1-800-752-0900, Ext. 2548.[†] You'll experience awes like never before.

HP Peripherals
When it's important to you.



**HEWLETT
PACKARD**

Breaking the page barrier.



The new TI microLaserTM Turbo printers. High-performance graphics at record speed.

Give yourself a breakthrough. The TI microLaser Turbos race through popular graphics software like Ventura Publisher[®] and Harvard Graphics[®] faster than other printers.

How?

The Turbos' RISC-based 8220 controller with PostScript[®] software from Adobe[®] processes information from the PC faster. So you spend less time waiting for graphic output.

Now give yourself all this speed and

PostScript Level 2 with 35 scalable fonts. Superior paper handling that includes a 250-sheet paper drawer that slides inside the printer. Automatic switching between HP LaserJet[®]/PostScript modes and PC/Mac[®] interfaces[†]. And two of the smallest footprints you'll find.

Plus, you can break the page barrier without breaking your budget. Designed for personal printing, the 9ppm microLaser

Turbo starts at \$2,249*. Ideal for shared printing, the 16ppm XL Turbo goes for \$3,649*.

Quick. Dial the number below for the name of your nearest TI dealer. And break some speed records of your own.

1-800-527-3500



**TEXAS
INSTRUMENTS**

71842

*Suggested retail price. †Requires optional AppleTalk[®] interface. microLaser is a trademark of Texas Instruments Incorporated. Ventura Publisher is a registered trademark of Ventura Software, Inc. Adobe, PostScript and the PostScript logo are registered trademarks of Adobe Systems Incorporated. HP LaserJet is a registered trademark of Hewlett-Packard. Mac and AppleTalk are registered trademarks of Apple Computer, Inc.

CIRCLE 353 ON READER SERVICE CARD

SOFTWARE ANTIVIRUS SOFTWARE

Since the program is a signature scanner, it didn't catch the Totally Hidden Virus. It was able to detect Joshi but couldn't prevent or remove the virus.

VirusSafe's documentation is slim but adequate. The program is also available in a network version, which is installed on a file server and can be used by individual users from their workstations. Program upgrade subscriptions cost \$60 annually, and site licenses cost \$20 each if you buy more than 50 copies. *VirusSafe* may not be adequate for high-risk situations, but it's a good scanner with frequent updates to keep it on top of new viruses.

Viruscan

by Henry Fersko-Weiss

Nearly as invisible as the viruses it is meant to catch, *Viruscan*, Version 77, from McAfee Associates, is a command-line-driven program without menus or program screens. With its bare interface

and packaging, this \$25 program is clearly intended for corporate MIS users and certainly has a lot to offer. *Viruscan* is a group of three programs—VSHIELD, *Viruscan*, and Clean-Up—that detect, remove, and prevent attack by 781 viruses and variations.

The memory-resident VSHIELD prevents infection by looking for virus signatures in memory, the boot sector, the partition table, and program files. It can also run a CRC check and stop the system from using an unrecognized file. The program runs in 34K RAM, which you can reduce to only 3K by using a command that swaps the program between memory and disk.

Viruscan is a nonresident virus detection program that also works with files, memory, boot sectors, and partition tables. The program looks for virus signatures and can run a CRC check. The network version of *Viruscan*, called *Netscan*, works on file servers and costs \$195 for up to ten



FACT FILE

Viruscan, Version 77

McAfee Associates, 4423 Cheeney St., Santa Clara, CA 95054; 408-988-3832.

List Price: *Viruscan*, \$25; VSHIELD, \$25; Clean-Up, \$35; site license for all three programs on five machines, \$195; *Netscan* with up to five nodes, \$195.

Requires: 256K RAM, DOS 2.0 or later.

In Short: *Viruscan* can prevent, detect, and remove 781 viruses. It's a command-line-driven program with text files on the floppy disk for use as the manual, making it best-suited for MIS people in corporate environments rather than individual users. The service and support from McAfee Associates are outstanding.

CIRCLE 410 ON READER SERVICE CARD

nodes. Complementing *Viruscan* and VSHIELD, Clean-Up repairs most infected files.

AT THE DOS PROMPT

You start and control the programs with a string of commands at the DOS prompt. For example, to run VSHIELD with CRC

Covering Your Bases

CONTINUED

ENCRYPTION'S DOUBLE EDGE

DiskLock (\$189) from Fifth Generation Systems (800-873-4384) uses disk locking and file encryption to restrict access to hard disks, directories, and files. Encryption software uses a FAT-scrambling or disk-scrambling technique that lies to DOS about the location of files and alters the contents of files beyond recognition. To read a file, you enter a password that restores the data.

Some standalone encryption packages use proprietary encryption methods, and a few implement the Data Encryption Standard (DES), an encryption algorithm that's virtually impenetrable, with a possible 72 quadrillion "keys."

The National Security Agency's quarterly listing of approved products (202-783-3238) lists *Watchdog* (\$295) from Fisher International Systems (800-237-4510) as providing DES encryption. *Watchdog* also comes with a proprietary encryption method that's

adequate (and faster) for securing information.

Encryption software can be a double-edged sword, turning your PC into an electronic paper shredder if you forget the password that decrypts files or unlocks a hard disk, or if a disgruntled employee encrypts critical files before leaving the company. These dangers have opened a window of opportunity for decryption software. *WPPass* (\$185) from Access Data Recovery (800-658-5799) reads encrypted *WordPerfect* files. Versions are also available for *Lotus 1-2-3*, *Microsoft Excel*, and *Microsoft Word*. Many encryption packages can provide master keys—utilities that help system administrators recover forgotten passwords.

THE BIG COVERUP

Screen savers offer an easy way to hide sensitive information displayed on an unattended PC. After a user-specified timeout, *AfterDark* (\$49.95), a *Windows* application from Berkeley Systems (415-540-5535), displays its collection of unusual animated sequences that can be customized to your taste.

Before returning you to your *Windows* application, the program prompts you for a password.

None of these security strategies are foolproof. There are ways to guess passwords, as the Robert Morris virus—named after the creator, a Cornell University student—proved in 1988 when it gained entry to 6,000 PCs on Internet by systematically guessing passwords.

To reduce the chance that your password can be guessed, *Password Coach* (\$795) from Baseline Software (800-829-9955), which runs on a network server, screens for common passwords, such as proper names, geographical locations, common words, and even personnel files.

Of course, password protection software only verifies the password and not the person who's using it, and that can lead to problems. Also keep in mind that some of the programs block the use of disk utilities like *The Norton Utilities* and *Mace Utilities*. For a look at hardware security solutions, see "Playing It Safe: Security Options for Existing Workstations" (*PC Magazine*, October 15, 1991). ■

SOFTWARE ANTIVIRUS SOFTWARE

Viruscan was able to prevent, detect, and remove almost all test viruses.

checking at boot-up, you might add this line to your AUTOEXEC.BAT file: VSHIELD/CV. Examples of *Viruscan* or Clean-Up commands include /A, which scans or repairs all files, and /MANY, which scans or repairs multiple floppy disks. There are 16 commands for *Viruscan*, and a subset of 6 commands controls Clean-Up.

Offering nothing more than straightforward antivirus features, *Viruscan*'s most unusual command is /EXT, which lets you use a search string you've written into an ASCII file—even for encrypted viruses. This makes it possible to do emergency virus detection and clean-up while you wait for McAfee Associates to

produce a formal addition to its programs.

Viruscan did well on PC Labs' tests. It was able to prevent, detect, and remove almost all the test viruses. The only difficulties it had were in detecting or removing the Totally Hidden Virus, repairing files infected with Red Cross (it offered to overwrite them instead) and preventing Joshi, which is impossible to stop altogether on a cold boot. Clean-Up does not return a disinfected file to its original size. In most cases, it adds 10 bytes to avoid the rare possibility of truncating valid data in a file.

ANTIVIRUS AGENTS

One of the biggest advantages of *Viruscan* is the service and expertise you get from McAfee Associates. Even if you don't own *Viruscan*, the company will help you with a virus infection. You can download any of the programs that might help from a continually updated bulletin board. The company also has trained specialists all over the world, who, for a fee (not to exceed \$130 an hour), will come on-site and help you disinfect your

system. *Viruscan* owners get two years of free support and quarterly program updates.

For corporate users and those who feel comfortable at the DOS command line, this program's ability to detect 781 viruses makes it worth serious consideration. But if you want colorful menus and on-line help you should definitely buy another package.

VirusCure Plus

by John R. Quain

IMSI's *VirusCure Plus*, Version 2.24, is a virtual panacea for computer viral ailments. Its all-in-one approach to preventing, detecting, and killing viruses proved very successful on PC Magazine Labs' tests. Like many other antivirus software marketers, IMSI has a licensing agreement with McAfee Associates (maker of *Viruscan*, also reviewed here) to maintain up-to-date scanning files for newly discovered viruses. This \$99.95 package comes with a menu-driven interface and a memory-resident infection monitor that

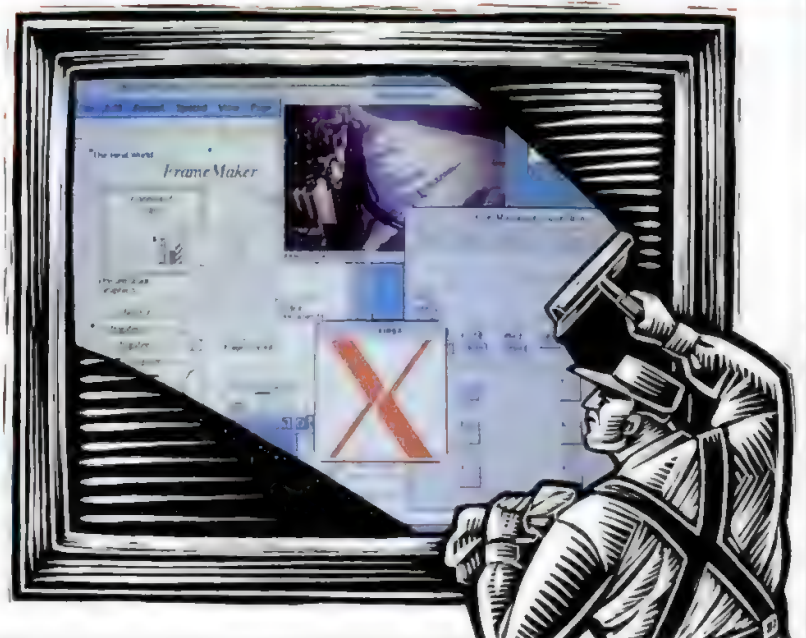
TURN YOUR PC INTO AN X WINDOW TERMINAL.

WITH OUR X SOFTWARE,
YOUR PCS BECOME THE PERFECT
SOLUTIONS FOR X WINDOWS.

CALL 1-800-800-9599

SPECTRAGRAPHICS

AVAILABLE FOR DOS AND WINDOWS 3.0

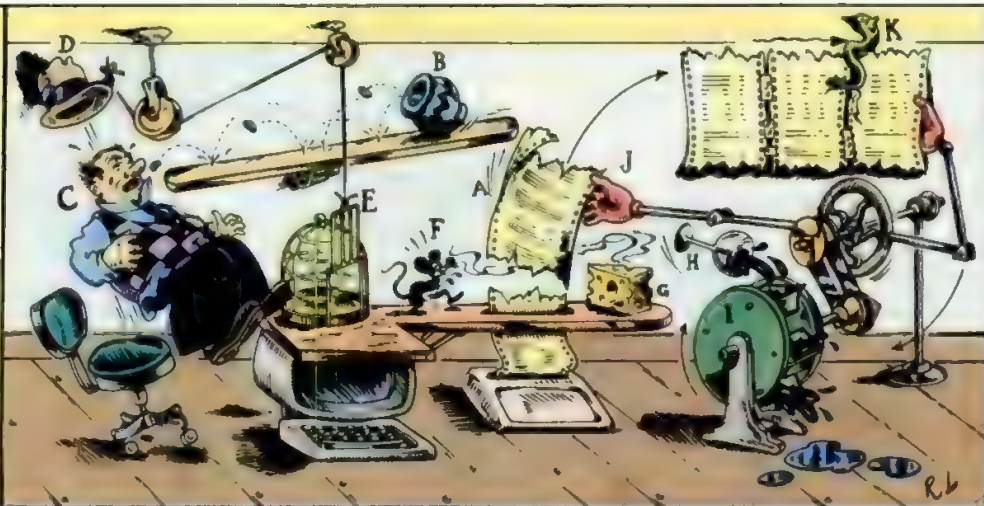


RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBODULATED THAT HIS HAIR STANDS ON END DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



New Sideways takes all the fun out of printing your 1-2-3 spreadsheets.

Introducing new Sideways version 3.3.

What do you do when your spreadsheet's too wide for your printer?

Simple. Just get out your scissors. Get out your stapler. Get out your glue and tape.

Or simpler yet, get Sideways.* It's everyone's favorite way to make high-quality, one-piece printouts with no assembly required.

Nothing's as straightforward as Sideways.

Sideways runs as an add-in to 1-2-3 Releases 2 and 3. As well as Symphony. So printing is fast and easy.

Done creating your spreadsheet? Just pop up Sideways from your 1-2-3 menu, highlight a range and print. With a wide range of printing options.

Mix bold, underlined, and expanded type, all on the same page. Print through or skip over perforations. Add borders, change page size, adjust margins just the way you want. With Sideways, it's simple.

Add just the right twist to your other printing, too.

Sideways is the right way to print with other spreadsheets, too. Like Quattro, Twin, Microsoft Works and LotusWorks. As well as databases, word processors, and project planners.

You get nine different typestyles to choose from. Plus bold, underlined or expanded type. Even foreign language and line drawing characters. If your software can create it, Sideways can print it. All in one piece.

New Sideways version 3.3 for the IBM PC and all popular printers. Available for just \$89.95 at software dealers worldwide, or directly from Funk Software with your check, Visa or MasterCard.

So stop fooling around with your wide spreadsheets. And get down to business with Sideways.



**FUNK
SOFTWARE**

Funk Software, Inc., 222 Third Street, Cambridge, MA 02142

© 1990 Funk Software, Inc. Sideways is a trademark of Funk Software, Inc. Other product names are trademarks of their respective owners. Sideways version 3.3 works with all releases of 1-2-3 as well as other software. Add-in capability requires 1-2-3 Release 2, Release 3, or Symphony.



To order call 1-800-822-3865, Ext. 115
(617-497-6339 in MA)



How the world sees you in Pseudo-Color



How the world sees you in Real-Color

Now you can afford to project a better image.

The portrait on the left reflects a pseudo-color LCD projection.

The portrait on the right reflects a real-color In Focus 1600LC LCD projection.

The difference in color is startling. The difference in price is just a few hundred dollars.

Which is almost nothing when you consider the impact the In Focus 1600LC creates in presentations.

Featuring the 16 most commonly used colors, the new In-Focus 1600LC gives your audience a dazzling view of

real color charts, graphs, rainbows and sunsets. With a resolution of 640 x 480.

In seconds, the 1600LC can be set on top of any ordinary overhead projector and connected to any color Macintosh or IBM compatible. It's that easy.

And the 1600LC is just one of a complete line of In Focus LCD projection panels ranging

from monochrome to 5000 colors with nearly photographic quality.

For more information or to arrange for a free demonstration, call

1-800-327-7231 or in Oregon, 503-692-4968.

And get the image you deserve.

InFocus
SYSTEMS

The new In Focus 1600LC LCD projection panel.

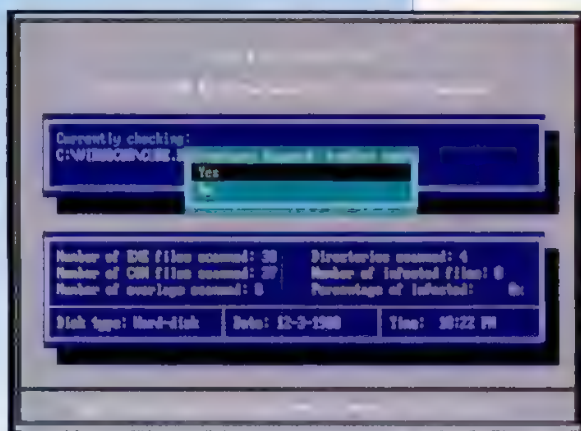


© 1991 IN FOCUS SYSTEMS INC. 7770 SW Yukon Street, Tualatin, Oregon 97062. 1-800-327-7231. In Oregon, 503-692-4968. Fax: 503-692-4470. In Focus, the In Focus logo and the In Focus 1600LC are registered trademarks of In Focus Systems, Inc. All other trademarks or registered trademarks are the property of their respective holders.

In Europe: Plasmavision 91, 2132HL, Houtdorp, The Netherlands. Fax: 31-(0)-2503-24388

CIRCLE 272 ON READER SERVICE CARD

SOFTWARE ANTIVIRUS SOFTWARE



VirusCure Plus's menus prompt users to scan other directories. Near the bottom of the screen, the program displays the results of the previous search, displaying the number of directories and .COM and .EXE files that were scanned.

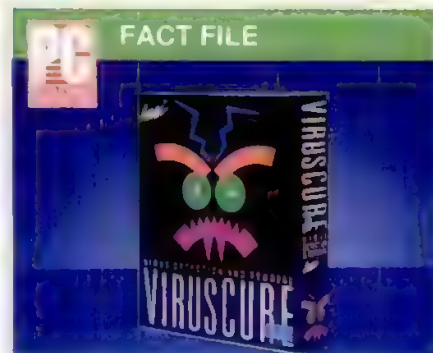
requires about 22K RAM.

VirusCure can be deployed in several ways: directly from the floppy disk to scan memory and hard disk space, as a

TSR, and from the hard disk for on-demand scans, prevention, and virus removal. It runs under *Microsoft Windows* as a non-*Windows* application and even includes its own death-mask *Windows* icon.

LAYERS OF PROTECTION

The automatic installation writes signature files for all executable files on your hard disk and stores the *VirusCure* TSR commands in AUTOEXEC .BAT for detection on boot-up. The memory-resident portion has two levels of protection. The first level searches for general symptoms that could be caused by a virus. If the program detects suspicious behavior, it prevents the execution of the questionable program, returns the affected area to its original state, and alerts the user. False alarms were not a problem in testing.



VirusCure Plus, Version 2.24

IMSI, 1938 Fourth St., San Rafael, CA 94901; 800-833-4674, 415-454-7101.

List Price: \$99.95; site license for 100 PCs, \$3,000; 10-user LAN package, \$450.

Requires: 256K RAM, DOS 2.1 or later.

In Short: *VirusCure Plus* is an all-in-one package that offers virus prevention, detection, and removal. Using a combination of memory-resident monitoring and file verification, this package thwarted all but one of PC Labs' test viruses.

CIRCLE 411 ON READER SERVICE CARD

The second level of protection monitors DOS function calls by using checksum analysis and virus signature comparison and by scanning conventional memory for viruses. It also checks the boot

Catch More Viruses Faster



Networld
booth #2043
Comdex #4454

now only \$149.95

Network support and Windows compatibility.

Before they multiply ...

Dr. Alan Solomon has been researching viruses for years. He knows where to look and what to look for. His Anti-Virus Toolkit catches all known viruses and new viruses - in less time. No false alarms. No missed viruses. No slowed performance. No matter how many new viruses are developed.

Dr. Solomon has the jump on viruses. Do you?

Ontrack
SOFTWARE CORPORATION

1-800-752-1333

International 612-937-1107 • Fax: 612-937-5815
6321 Bury Drive, Eden Prairie, MN 55346



CIRCLE 133 ON READER SERVICE CARD

SOFTWARE
ANTIVIRUS SOFTWARE

sectors of floppy disks when a DIR command is issued.

Once *VirusCure* is installed on a hard disk, it can scan conventional memory and make routine scans of files, directories, and entire logical drives. Its progress is tracked on a file-by-file and directory-by-directory basis. When a virus is detected, you have the option of removing or repairing infected and damaged files, including restoration of the critical CMOS

setup, partitions, and the file allocation table.

REPAIRING DAMAGED FILES

When *VirusCure* detects a virus, it informs you of the infected files and the virus that has been contracted. You can continue checking, remove the virus, stop checking, or ask for more information on

the virus. Choosing more information will call up several screens of text describing what it is that has bitten your system, what its effects are, and procedures of removal. A recent enhancement provides descriptions of over 500 viruses.

Once an infection has been expunged, *VirusCure* reports that the infected files have been returned to their original sizes and healthy state. If a program has been damaged, *VirusCure* will attempt to repair it. On PC Labs' tests, *VirusCure's* approach proved successful. It managed to detect, prevent, and remove all but one virus—the Red Cross strain that foiled most of the McAfee scanner-based packages, including *Viruscan*.

MSI's updates are free via a bulletin board service or available for \$30 a year through the mail. Registered users receive *VirusCure* upgrades free for two years. If, like most users, you are not careful about sharing floppy disks and downloading files, the cost of *VirusCure Plus* is a small price to pay for a competent virus detection, prevention, and removal package.

Virus Guard

by Emerson A. Torgan

Virus Guard, a \$24.95 package from IP Technologies, takes the most rudimentary approach to virus detection and offers no services of value to an infected system.

Extra-Strength Medicine at a New Low Price!

Virex® for the PC with great new features and a new low price of \$99.95 now gives you affordable virus protection. It's amazing how far a little money will go to protect your data.

Great New Features

The Virex 2.0 TSR requires less than 1 KB to provide full-time protection against both known and unknown viruses. Other great new features include file inoculation to let you recover from any infection, an action learning mode to enhance ease of use, and Netware and Windows compatibility. Virex for the PC even has a new look. Its menu-driven installation program makes it easier to use than ever.

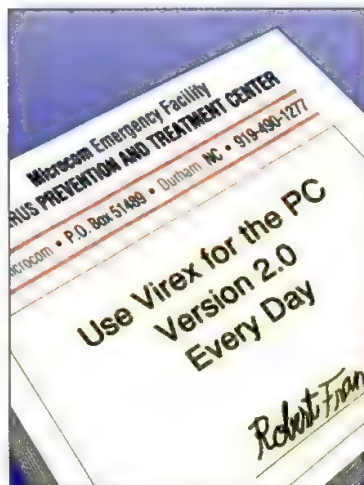
Six Months of FREE Updates

With new viruses being discovered more than once per week, new product updates are important. We update Virex at least once per quarter and updates are delivered to your door automatically. The first six months of updates are **free** when you buy Virex.

Great Value

With its great new features, extensive support service, and new low price, Virex is excellent value in virus protection.

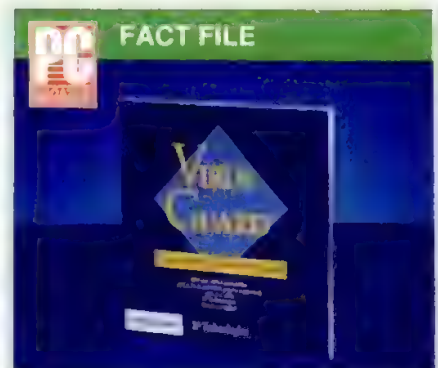
Get Virex 2.0 Today!



P.O. Box 51489, Durham, NC 27717 (919) 490-1277, ext. 901

Virex is also available for Apple Macintosh computers.

© 1991 Microcom Systems, Inc. Virex is a registered trademark of Microcom Systems, Inc.



Virus Guard

IP Technologies, 3710 S. Susan St., #100, Santa Ana, CA 92704; 714-545-9001.

List Price: \$24.95.

Requires: 128 RAM, DOS 2.1 or later.

In Short: *Virus Guard* must be loaded on the hard disk of a clean machine. It offers no protection, only generic detection by comparing the checksum, and warns you when file sizes have been altered. It cannot prevent infection, identify viruses by name, or detect stealth viruses.

CIRCLE 412 ON READER SERVICE CARD

STAT 101 PRIP GOSSET 10/11

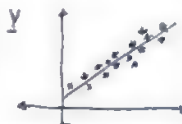
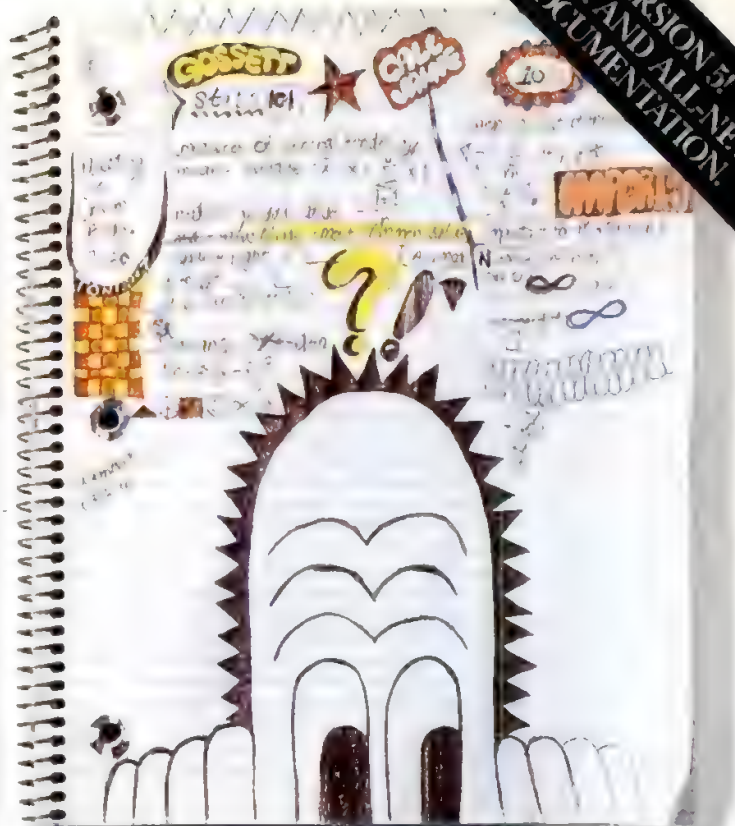
→ Measures of Central Tendency:
 arithmetic mean = "average" = $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$
 median = middle value
 mode = most common value
 skewness to right  and to left 

→ Measures of Dispersion (or "spread" of the data).
 Variance = $s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$ (unbiased with $n-1$ in denominator)
 Standard Deviation = $s = \sqrt{s^2}$
 Coefficient of Variation (c.v.) = $100 \left(\frac{s}{\bar{x}} \right)$

→ Sampling Distribution of the Mean:
 $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$. We estimate σ with s ; taking large n .
 For $n \rightarrow \infty$, $\bar{x} \sim N(\mu, \sigma_{\bar{x}})$
 (68% within 1 std. error, 95% within 2)

→ Least-Squares Regression:
 Data X , estimates b , dependent values Y
 $Y = Xb \Rightarrow b = (X'X)^{-1} X'Y$

$$\sum_{i=1}^n (y_i - \hat{y}_i)^2$$

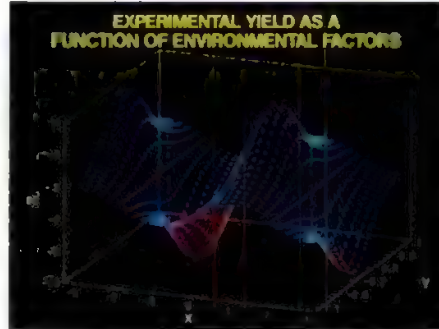
Statistical Graphics Software For Those Of You Who Majored In Statistics. And Those Of You Who Didn't.

If you majored in statistics—heck, if you *understood* statistics—one look at the over 250 built-in statistical functions will tell you that STATGRAPHICS® graduated summa cum laude. If you don't remember the first thing about statistics, don't worry. STATGRAPHICS does. And then some.

Whether you have demographic information, manufacturing yields or instrument readings, STATGRAPHICS can quickly digest thousands and thousands of numbers and calculate the key points you need. How to adjust insurance rates for different classes of drivers in different jurisdictions. Where the production bottleneck really is. What numbers alone won't tell you, STATGRAPHICS will. And then sum up the information in one of over 50 types of graphs that, in the words of PC Magazine, "will knock your socks off."

BY THE NUMBERS.

If you remember all those statistical buzzwords, here are some of STATGRAPHICS':



ANOVA, regression analysis, multivariate and nonparametric techniques, forecasting and time series analysis, quality control, experimental design and much more. If you don't remember any of those, here are some others: On-line help,

handy reference cards, telephone support, training and consulting. Along with the ability to import files from Lotus® dBASE® ASCII or DIF formats. And praise from all the major magazines for our ease of use.

KNOWLEDGE IS POWER.

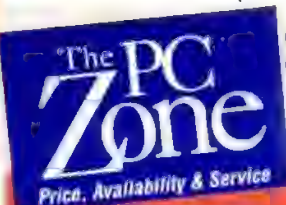
POWER IS \$995.

Call today for more information and a free demo disk. If you're a statistician, you're really going to like it. If you're not a statistician, you're going to love it.

STATGRAPHICS

In Maryland, (301) 984-5123. Outside The U.S., (301) 984-5412

(800) 592-0050 Ext. 200



Small Business Productivity Solutions Are Our Specialty—Ask our PC Advisors

Our commitment:

At the PC Zone we take great pride in providing our customers with excellent service and the widest selection of software and hardware products available. Our customers are very important to us and they deserve the best.

Now Open 24 Hours

**1 Mb SIMMs
1 x 9 x 80ns**

\$59

Between MS-DOS 5, Windows, and all the other hot new programs on the market today, memory can quickly become a scarce resource. At this low price, now's the time to increase the memory capacity of your computer.

Microsoft MS-DOS 5 Upgrade

\$59

When you install this operating system upgrade on any PC with an 80286 or higher processor, you automatically give your applications more room in which to work. If you have one or a thousand computers to upgrade, MS-DOS 5 is the best choice for convenience, security and reliability.

BUSINESS		
Alpha Software	Alpha Four 1.1	299
Ashton Tate	Dbase IV 1.1	489
Blyth Software	Omnis 5 For Windows	539
Borland International	Paradox 3.5	519
	Paradox 3.5 Lan Pk (5 User)	713
Buttonware	PC File 6.0	85
Delrina Technology	Performpro For Windows	189
Fox Software	Fox Pro 2.0 Single	515
	Foxbase+Develp.Sys 2.1	185
Informix	Wingz For Windows	319
Lotus Corp	Lotus 123 Rel 2.3	329
	Lotus 123 Rel 3.1+	429
	Lotus Ami Pro 2.0	304
Microrim	R:Base 3.1 Single User	479
	R:Base Personal	89
Microsoft Corporation	Excel 3.0 For Windows	309
	MS Office For Windows	479
	MS Word 5.5	205
	MS Word For Windows 1.1	309
	MS Works 2.0	95
Nantucket Corporation	Clipper 5.0	509
Precision Software	Superbase 4.1 2/Windows	419
Software Publishing	Professional Write 2.2	159
Software lib/osjmg	Professional Write Plus	165
Spinnaker	Pfs: Window Works	123
Symantec	Justright V1.0/Windows	79
	Q & A 4.0	249
	Q & A 4.0 NetwkrPkdI Med	319
WordPerfect Corporation	Letterperfect 1.0	125
	WordPerfect 5.1	239
	WordPerfect 5.1 20 Pk	3300
	WordPerfect 5.1 5 Pk	1100
	WordPerfect /Wdws 1.0	299
Wordstar U.S.A.	Wordstar 6.0	255

Lotus 1-2-3 for Windows

CALL FOR OUR LOW PRICE

NEW!

With 1-2-3 for Windows you get a spreadsheet that takes complete advantage of the Windows operating system. Windows users will feel right at home with pull-down menus and dialog boxes. It's compatible with all 1-2-3 files, styles and macros. Just a press of the slash key brings familiar 1-2-3 Classic commands to the screen.

Microsoft BallPoint Mouse

\$125

Introducing a Microsoft mouse designed especially for laptop computers. Whenever space is at a premium, clip the BallPoint mouse onto your keyboard and get the same high resolution and performance as you do with the best-selling Microsoft Mouse.

Now! You can place your PC Zone order through CompuServe...

Just Access:

Go MZ

Multiple Zones International, Inc.

NEW PC Zone SERVICE!

ACCOUNTING

Dac Software	Dac Easy Bonus Pack 4.1	125
Great American Software	OneWrite Plus Acctng 2.06	165
Hooper International	Check It Out 5	36
	Taking Care of Bus 5 Mod 5	78
	Taking Care of Bus 8 Mod 5	179
Intuit	Quicken 4.0	35
M-USA	Pacioli 2000 - PC	32
Meca Ventures	Checkwrite Plus 1.1	30
	Managing Your Money 7.0	129
Peachtree Software	Peachtree Complete III	139
	Peachtree III Bundle	215
Reality Technologies	Wealthbuilder 1.1	135
Timeslips	Timeslips III 4.0	185

Delrina PerFORM Pro

Recently given PC World's Best Buy Award, this high-end program lets you design, fill in and maintain customized business forms. Includes the ability to build simple to complex calculations, database lookups, data entry validation tables and electronic security.

\$189

Free Shipping on Orders Placed between 9pm to 7am Eastern Time



NOW! Canadian customer orders delivered within 24 hours in most cases. By special arrangement with Canadian Customs all applicable duties and GST taxes will be charged when placing your order with the Zone. Your products can now be delivered hassle free through Customs without delay. Shipping charges as low as \$16 (US) via Airborne Express. Call for complete information.

HARD DRIVES

Imega - Bernoulli

Bernoulli 44Mg Cartridge(3) 249
Bernoulli B244X 44Mg Ext 1894

NEC Home Electronics

Cdr-36 Cd Rom w/ PC Adaptr449
Cdr-83 Inter. Cd Rom Drv ... 480

Plus Development

Hardcard II XI 105Meg 9Ms 589
Hardcard II XI 50Meg 9Ms ... 389

SyDOS

44/2 Rem HD External 1549
44E Rem HD External 759
44I Rem HD Internal 629
88/2 Rem HD External 1849
88E Rem HD External Kit 999
88Ex Driver/Ctrlr Kit 279
88Ex Rem HD Extnr/No Kit . 749
88I Rem HD Internal 949

DesignCAD, Inc. DesignCAD 3-D V.3.1



\$199

DesignCAD 3D gives your PC the power of a mainframe CAD system! You can produce complete 3-dimensional models and drawings once impossible on your computer. BasicCAD, the phenomenal Basic-like

programming language, is now included FREE

MODEMS & FAX BOARDS

Cardinal

2400 Baud Ext Modem 84
2400 Baud Int Modem 78
2400Mnp Ext Modem 165
9600V 42Bis Ext Modem 459

Computer Peripherals

Viva 9600 V.42 Ext. Modem 479

Intel

Intel Satisfaction Fax Board 389

Practical Peripherals

Modem 2400 V.42Bis 195
Modem 2400Sa V.42Bis 215
Modem 9600 Sa 488
Pocket Modem 2400 105

Prometheus/Promodem

24/96Bsr Fax Modem 199
9600+ Ext. Modem 630
Ultima 14.4 Modem 699

Relisys

Relisys Tefax 869

Teletel

T-1000 9600 Bps Modem ... 549

The Complete PC

The Complete Fax 9600 288

U.S. Robotics/Courier

Hst 14.4 Modem Ext 624
Hst 14.4 Modem Internl 598
V.32 9600 Extern Modem 674

Zoom Telephonics/Modem

Fmc9624 24/96 Srfax 135
V42X 2400-V.42 Ext 195

VIDEO CARDS & MONITORS

ATI

VGA Wonder+ 512Kw/Mouse225

Emerson

14 Paper White VGA Monitor 99

Idek (Dist By Mandax)

17 VGA Monitor 1425
17 VGA Monitor+ SVGA Cd1695

Keypoint, Inc./Viewsonic

4 Super VGA Monitor 399
5 Super VGA Monitor 649
Perfectview VGA Card 165

NEC Home Electr./Multisyncs

4D VGA Monitor 1049
3D VGA Monitor 669
5D 20 VGA Monit 2334

Paradise

Paradise Basic VGA Card 129

Video Seven

V-Ram 512K VGA Color Bd. 345

Zenith

Zcm-1492 Flat VGA Monit ... 588

Generic Generic CAD 5.0

Generic CADD 5.0 is the latest release of the computer-aided design and drafting program that changed the CAD marketplace. It's perfect for both occasional users and those who need it daily. New features include fully associative dimensioning, complete undo/redo, attributes, point-and-click file handling, and commands for grouping of objects to be edited

\$285



Automap, Inc. Automap Road Atlas

Plan your
Fall Trips!

\$55



Just tell Automap where you're starting and where you want to end up. Automap takes it from there, showing the shortest, or quickest, or 'most scenic...whatever route is right for you. Get full-color maps, detailed driving instructions and map overlays. You can also print out directions, maps, mileage charts and drive times.

Addstar

Superstor V1.3 CompresSW .89

Adobe Systems

Adobe Type Align/Windows .. 68
Adobe Type Mgr/Windows ... 58

Berkley Systems Design

After Dark 28

Central Point Software

PC Tools Deluxe 7.0 105

Gibson Research

Spinrite II V2.0 63

hDC Computer

First Apps For Windows 48
hDC File Apps 68

Landmark Systems

PC Probe - Cpu Diagnostics .99

Lasertools

Printer Control Panel 99

Merril & Bryan

Turbo Ems 6.0/Windows 55

Multisoft

PC Kwik Powerpak 2.0 69

Publishing Technologies

File Organizer 125

Quarterdeck Office System

Qemm 5.1 59

Software Workshop

Icon Pak 1 35

Stac Electronics

Stacker 89

Symantec

Norton Anti-Virus 83

Norton Commander 3.0 92

Norton Desktop/Windows 98

Norton Utilities 6.0 114

The Norton Backup 1.2 94

Touchstone

Check-It! 3.0 82

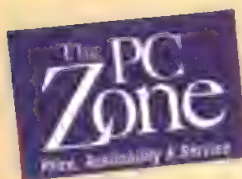
Xtree Company

Xtree Gold V.2.0 92

Zenographics, Inc.

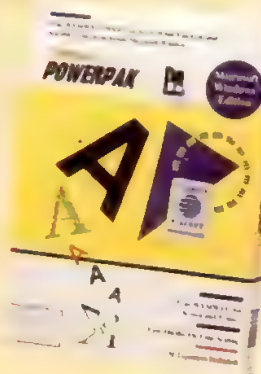
Super Print 1.1/HP Laser 113

OVERNIGHT SHIPPING • 1-800-258-8088 • \$6 PER ORDER IN THE US



Over 1500 best-sellers in stock

Call for our Complete Product Listings



Atech Publishers Powerpak for Windows

\$49

Awarded *PC World's* Best Buy for 1991, Publisher's Powerpak provides custom screen fonts and true WYSIWYG capability for all Windows applications. It's an enhanced printer driver and provides a complete library on inexpensive, scalable fonts for Windows, from 4 to 500 point size. It works with dot-matrix, inkjet and laser printers in any Windows application.

CAD/DRAFTING

Autodesk, Inc.	
Autosketch 3.0	145
Computereasy Software	
Dream House Professional ...	45
Floor Plan	25
Design Cad, Inc.	
Design Cad 2D V5.0	182
Design Cad 3D V3.1	199
Dynaware USA, Inc.	
Dynaperspective DOS	599
Foresight Resources	
Draft Cad For Windows	429
Generic Software	
Cad 3D Drafting	198
Cad 5.0	285
Cad Auto Convert 5.0	58
Mathsoft	
Math Cad 3.0/Windows	309

Adobe Type Manager



Adobe Type Manager 1.1

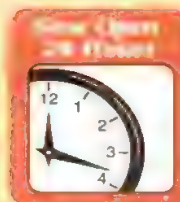
\$58

Get crisp, clean-looking text automatically, at any point size and in virtually any Windows 3.0 program with Type Manager including ATM software. You also get near-laser-quality output with the HP LaserJet, DeskJet, dot matrix or other non-PostScript printer.

Type Align

\$58

Type Align for Windows is a powerful desktop publishing and graphics tool for manipulating text. Stretch text to fit curves, spirals, circles, freehand drawing figures—indispensable for any design or graphics person. Must be used with Type Manager.



Berkeley Systems After Dark for Windows

\$28



When your computer is on but unattended, images burn into your screen, causing permanent damage. After Dark prevents burn-in by automatically displaying animated

screen art. It has over 35 different displays and sound. You can even use your company logo or other graphics, type messages or set up Slide Show style presentations.

Accolade	
Hardball II	32
Jack Nicklaus Unlimited Golf ..	35
Artworx	
Strip Poker III	39
Broderbund	
Sim Earth PC	43
Simcity 1.07	29
SimcityGraphic Set2 Future ..	25
Where In USA Is Carmen S ..	29
Where In World Deluxe Ed.	49
Where In World Is Carmen S ..	29
Where In Time Is Carmen S ..	29

Electronic Arts	
Andretti's Racing Challenge ..	29
Chessmaster 2100	34
Chuck Yeager's Air 2.0	30
Chuck Yeager's Air Combat ..	39
Earl Weaver Baseball	30
Life & Death II: The Brain	29
MegaFortress Flight/Old Dog ..	39
Mediagenic	
Battle Chess II	29
Microprose	
F-19 Stealth Fighter	37
Microsoft Corporation	
Aircraft & Scenery Design Kit ..	28
Flight Simulator 4.0	39
Windows Entertainment Pack ..	26

Origin	
Bad Blood	35
Wing Commander	45
WC Secret Missions	20
Sierra	
King's Quest V VGA	39
Sphere - Spectrum Holobyte	
Tetris	21
Toyogo	
Nemesis Go Master Deluxe ..	87
Virgin Mastertronic	
Scrabble Deluxe Edition	32
XOR	
NFL Challenge	59

**MUSTS
for your PC!**



Metz ThreadZ File F/X

\$74

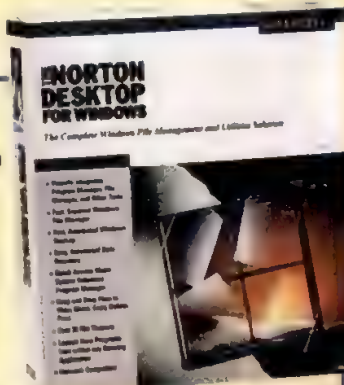
F/X File Manager harnesses the full power of DOS and Windows without cumbersome commands.

Streamline your everyday file management chores with it's intuitive "point and shoot" operation. It features a task manager, file undelete, file manager, text search and file find.

Symantec Norton Desktop for Windows

\$98

The Norton Desktop for Windows is the only complete Windows file management and utilities solution. It uniquely integrates the functionality of Windows 3.0 File Manager and Program Manager into one seamless desktop. It also includes automated backup and data recovery and other indispensable productivity tools



We're Dedicated to Bringing You The Newest Products at the Best Price



**Roykore
ABC
Flowcharter**

\$185

ABC Flowcharter is the flow diagram and organization chart program specifically designed to take advantage of today's high speed, graphics-based PCs. It's simple to learn and use with fast and easy drawing tools and object editing, has comprehensive text capability and flexible chart sizes, and extensive printer support.

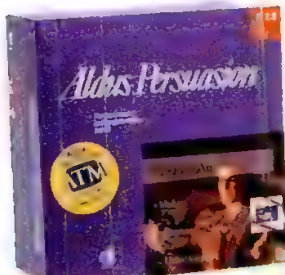
COMMUNICATIONS

Co/Session	Dynamic Microprocessor/PC
Co/Session - Cosession 5.0 .. 109	Anywhere III V.3.11 75
Alien Computer	Anywhere IV Host&Remote .. 99
Faxit! - Fax It 119	Futuresoft
Compuserve	Dynacomm 3.0 Async Vers 190
Compuserve Info. Mdb Kit 19	Hayes
Crosstalk Communications	Smartcom Exec 2.0 74
Crosstalk Communicator 58	Hilgrave/Hyperaccess
Crosstalk For Windows 122	5.0 DOS/OS2 .. 114
Crosstalk Mark IV 140	Microcom
Remote II 2.0 106	Carbon Copy Plus 6.0 114
Remote II Host 2.0 78	Prodigy
Datastorm Technologies	Prodigy Start Up Kit 26
Procomm Plus 2.0 64	Software Ventures
Delrina Technology	Microphone II For Windows 225
Winfax Pro 75	

**Aldus
Persuasion 2.0
for Windows**

\$329

Aldus Persuasion is the complete desktop presentations toolkit for choosing your design, for developing your content, for adding graphics, for organizing and printing your finished presentation. It turns your ideas into powerful, effective visual statements in no time.



GRAPHICS

Z-Soft	Publisher's Paintbrush 299
Adobe Systems	Illustrator Windows 1.0 314
Aldus Corp.	Aldus Persuasion 2.0/Win 369
Banner Blue Software	Family Tree Maker 1.0 44
Computer Support Corp.	Arts&Letters Graphics Editor 365
Corel Systems	Corel Draw 2.0 369
Digital Research	Gem Artline V2.0 425
	Gem Presenta Team 2.0 309
Electronic Arts	Deluxe Paint II (Enhanced) ... 79
hDC Computer	Icon Designer 33
Lotus Corp	Freelance Graphics 4.0 329
Micrografix	Charisma For Windows 339
	Designer 3.1 459
Microsoft Corporation	Powerpoint For Windows ... 315
Patton & Patton Software	Flow Charting III 138
Roykore	ABC Flowcharter/Windows 185
	Instant Orgcharting/Window 125
Software Publishing	Harvard Geographics 265
	Harvard Graphics 3.0 359
WordPerfect Corporation	Dataperfect 258
	Drawperfect 1.1 265
Z-Soft	PC Paintbrush IV Plus 109
Zenographics, Inc.	Pixie 2.0 164

Freelance Graphics



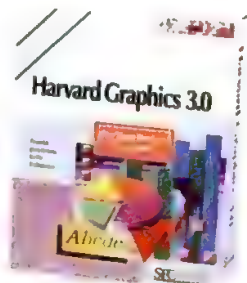
**Lotus
Freelance
Graphics 4.0**

\$329

Freelance Graphics offers you a graphical WYSIWYG environment unlike any other in the world of DOS. You can work with actual colors and fonts right on your screen and know what your graphics look like before you print. It's loaded with Smart Features—to automate the process of creating show-stopping slides, overheads and handouts.

**Software
Publishing
Harvard
Graphics 3.0**

\$359



Harvard Graphics 3.0 provides business users with the ability to create persuasive charts and graphs. It combines advanced charting, drawing and presentation tools with an intuitive interface. Choose the format that best conveys your information, then add impact with the comprehensive assortment of drawing tools.

**Roykore
Instant
ORGcharting!**

\$125

Type in names or other personnel information and Instant ORGcharting! automatically draws a perfectly spaced and aligned chart. Just point and click to delete, add, or promote personnel. Includes automatic line and box connections, multiple fonts within a box, database import, picture and notes attached to boxes.



PROGRAMMING

Asymetrix Corp.	Toolbook 1.5 For Windows 295	Harvard Associates	PC Logo 3.0 55	Multiscop	Debugger For OS/2 319
Borland International	Borland C++ V2.0 329	Knowledge Garden	Knowledge Pro/Windows ... 399		Debugger For DOS 125
	Borland Objectvision 89	Microsoft Corporation	Basic Prof.Dev.System 7.1 . 319		Debugger For Windows 269
	Turbo C++ 2Nd Ed. V1.0 74		C Compiler 6.0 315	Solution Systems	Brief For C++ 95
	TurboDebugger&ToolsV2.0 110		Cobol Compiler 4.0 544		C-Worthy 325
	Turbo Pascal For Windows . 179		Macro Assembler 6.0 90		Charge 69
	Turbo Pascal Profes.6.0 199		Pascal Compiler 4.0 181		Dbrief 95
Brightbill Roberts	Hyperpad 78		Quick C 2.5 69		Sourceror's Apprentice 359
Digital	Smalltalk DOS V3.0 58		Quick Pascal 1.0 65	Spectra Publishing	Power Basic 2.0 78
	Smalltalk V Windows Vers . 299		Quickbasic 4.5 69		Spinnaker
	Smalltalk/V 286 1.1 118		Visual Basic For Windows .. 128		Spinnaker Plus 2.0 275
			Windows 3.0 SW Dev Kit ... 318		True Basic
			Windows Device Driver Kit . 365		True Basic 2.1 51

CALL FOR OUR
FREE CATALOG
1-800-258-8088
USA DE CANADA

- All major credit cards accepted. No surcharge.
- Your credit card is not charged until your order is shipped. For domestic orders, if we must ship a partial order, freight is not charged on backorder.
- Most personal and company checks received by mail will clear immediately. All checks or purchase orders must have a phone number and contact person listed in order to be processed.
- C.O.D. orders are accepted. Limit \$1,000 per order. Cashier's check or money order only. Add \$5.00 per C.O.D. order.
- Educational, government and corporate purchase orders are accepted.
- All U.S. shipments insured at no extra charge.
- No sales tax except for Washington State residents (add 8.2%).
- Prices and product availability subject to change without notice. All specials and promotions are limited to 1 available stock. Please call for current prices.
- All products covered by 120 day limited warranty.
- Shipping is \$6 per order. We ship via Airborne Express Overnight service. (Some rural areas require an extra day for delivery.)
- Monitors are assessed an additional shipping charge. \$29.00 for Full Page. \$50.00 for Two Page. UPS Rates are also available upon request.
- Orders placed by 9pm ET (6pm PT) weekdays for in stock items will ship that day for overnight delivery (barring system failure, etc.).
- APO/FPO box orders are shipped first class U.S. Mail.
- Defective software will be replaced immediately, and hardware will be repaired or replaced at our discretion.
- For Customer Service call 1-800-248-9948. A Return Authorization Number is required for any product returned. Please call weekdays from 8am to 4pm PT, 9am-11pm ET.

PC Zone 18005 NE 68th St, Suite A110 Redmond, WA 98052
International: 206-883-3088 • FAX: 206-881-3421

CALL NOW • 1-800-258-8088 • OPEN 24 HOURS

Upgrade
to NOS 4.0 today!
Call 602-293-6363

**"We launch
1000 shuttle trips
every day with
our LANtastic[™]
network."**

—John Kindt, President,
Prime Time Shuttle, Sun Valley, CA



ARTISOFT SHATTERS THE MYTH!



For more information call Artisoft at (602) 293-6363,
or visit your Artisoft Authorized Five Star Dealer.

**AUTHORIZED
DEALER**

©1991 by Artisoft, Inc. All rights reserved. LANtastic is a registered
trademark of Artisoft, Inc.

On a normal day, Prime Time Shuttle makes 1,000 trips from four Los Angeles airports, one AMTRAK station, and the San Pablo Harbor, via LA's notorious freeway system, to homes and offices in four Southern California area counties.

At any given moment Prime Time Shuttle has 60 to 90 vans on the road. They track every flight so they know when each passenger arrives. They promise service within 15 minutes of the reservation or the ride is free, a promise they keep 97% of the time.

How do they do it? Back at headquarters, computers are taking reservations, verifying credit card charges, blocking reservations to assign to drivers, tracking the vans along the highways, recording the drivers' commissions as they are earned, and updating management with constant progress reports.

Kory Washburn is the assistant manager of Prime Time Shuttle who set up the computer system. He started December 23, 1990 with one dispatcher's computer. Now he's running 30 machines on a

LANtastic Ethernet system, and expects to add a new computer to the system every week until they reach 50 nodes.

He chose LANtastic because of the flexibility of its peer-to-peer structure. "Instead of a single overloaded server, we broke down the tasks, spread them over multiple servers and still fully interconnect the system with cheapernet cable."

Washburn praises Artisoft hardware and LANtastic software compatibility with other manufacturers' cards and systems. "You can't beat the price. And the speed is incredible, especially the way we abuse the system," he confessed.

"Artisoft tech support stuck with us until they solved our problems. They were great."

There's a myth that LANtastic is only suited to small, simple systems. But next time you need a ride from LAX, remember LANtastic is the Prime Time network.

ARTISOFT
Revolutionizing Connectivity

The package must be loaded onto the hard disk of a clean machine, where it creates signature files during the automated installation procedure.

Virus Guard consists of two programs, SigGen and RAMWatch. SigGen creates the signature files for the programs on your hard disk, and RAMWatch uses these files to compare a program you've just loaded to its recorded signature.

If RAMWatch detects a change in the file size of a program you are about to run, a generic window appears, warning you that the file has been altered intentionally or by a program crash or virus. At that point, you can abort, run SigGen, double-check the existing signatures, or rebuild the signatures and accept the change in file size. You must rebuild the signature files when new software is added.

Virus Guard cannot remove a virus or detect a virus present prior to installation unless it continues to spread. It can't prevent a system infection after installation. What it can do is compare the checksum and alert you that file sizes have been altered. Consequently, it is completely ineffective against stealth viruses. The documentation recommends that you back up your entire hard disk after installation and again at regular intervals. Should RAMWatch detect an error, you can use SigGen to isolate the infection and manually remove each infected file. If reinfection occurs, you may have to reformat your hard disk.

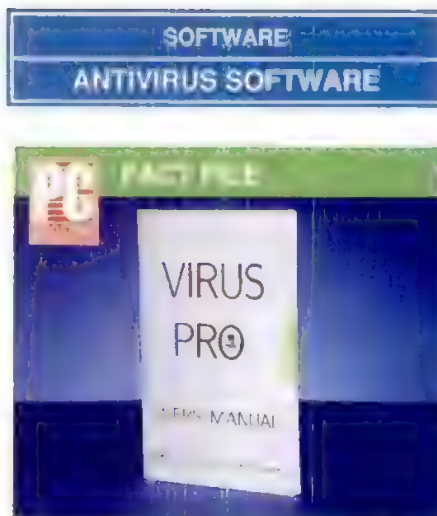
Developed in 1988, *Virus Guard* hasn't been upgraded from its original release. As a result, the package is not equipped to deal with the complexities of today's trickier viruses.

Virus-Pro

by John R. Quain

International Security Technology's \$50 *Virus-Pro*, Version 2.1, is designed with the corporate PC manager in mind. Its method for detecting viruses is accurate, uncovering every virus on PC Magazine Labs' tests. However, users need to be well versed in virus behavior to interpret its technical reports, which makes the program inappropriate for individual users.

Virus-Pro is not able to stop viruses from infecting your system or provide treatment once you've discovered symptoms. The program does not check for



Virus-Pro, Version 2.1

International Security Technology Inc., 515 Madison Ave., #3200, New York, NY 10022; 212-288-3101.

List Price: \$50; single network server, \$300; single-site corporate version (up to 15 PCs), \$450.

Requires: 512K RAM, DOS 2.1 or later.

In Short: Primarily a method for verifying that a PC is infection-free, *Virus-Pro* won't satisfy the antivirus needs of individual PC owners. On PC Labs' tests, however, it detected every virus it encountered, making it a valuable tool for corporate PC managers.

CIRCLE 413 ON READER SERVICE CARD

memory-resident infections, and unlike a product such as *Viruscan*, *Virus-Pro* does not scan for virus-identifying byte signatures.

CATCHING SUSPICIOUS ACTIVITY

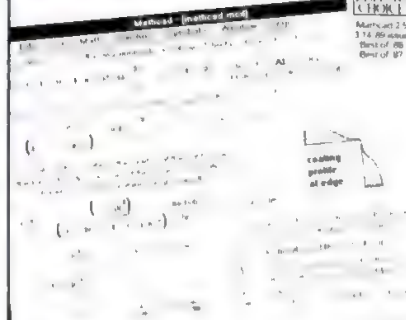
So why would you want *Virus-Pro*? Because its single-minded approach will catch nearly every file or sector change made to your hard disk. It indicates the infected files and explains how the change happened. If you know what symptoms to look for, *Virus-Pro* will help you catch virtually any virus without requiring you to update the software constantly or relinquish hard disk space.

To install the program, you make a bootable (720K or larger) working floppy-disk copy of *Virus-Pro*. By scanning the hard disk with the program's CHKDRIVE command, you create a signature file (or snapshot) of the drive and its contents. The snapshot is then stored on the working floppy disk. Later, when you scan the disk again, a comparison with the original snapshot reveals any changes that have occurred.

Performing a scan requires booting up the system with the working floppy disk to eliminate any memory-resident viruses. Technically oriented users won't mind the unembellished system prompts, which allow for either automatic or manual com-

Technical calculations made easy!

ALL NEW VERSION 3.0!



Now it's easier than ever to perform faster, more reliable engineering and scientific calculations.

- **Windows graphics features make Mathcad 3.0 the simple solution to complex analytic needs.** Dialogs, pull-down menus, and mouse point-and-click capabilities make it easy to combine equations, text, and graphics right on your screen and print it all in a presentation-quality document
- **New Electronic Handbook Help facility serves as an on-line reference library.** Paste standard formulas, constants, and diagrams from searchable, hypertext Electronic Handbooks for instant use in your Mathcad worksheet
- **Symbolic calculations with a simple menu pick.** Use expressions resulting from symbolic derivations in your numeric calculations or for further symbolic manipulation
- **Mathcad works on PC DOS, PC Windows, Macintosh, or UNIX.** More than 120,000 engineers, scientists, and educators already use Mathcad for a variety of technical applications. Applications packs are also available to customize Mathcad for particular disciplines, including electrical, mechanical, and civil engineering and advanced math

Call 800-MATHCAD or use this coupon to request a free 3.0 demo disk!

In Massachusetts, call 617-577-1017. Please specify diskette size

3 1/2" 5 1/4"

For a free Mathcad 3.0 Introductory kit, clip this coupon and mail it back to us, or fax it to 617-577-8829. Or circle your reader service card.

Yes! Tell me more about Mathcad 3.0!

Name _____

Title _____

Company or Institution _____

Address _____

City _____ State _____ Zip _____

Phone (_____) _____

Math Soft Mail this coupon to
MathSoft, Inc.
 201 Broadway
 Cambridge, MA 02139
 USA
 PCM TECH 3.0

SOFTWARE ANTIVIRUS SOFTWARE

parisons. In automatic mode, if there's an exact match, *Virus-Pro* stores the new scan file. In manual mode, the program writes a new scan file without deleting the old one so you can compare all the various versions that have been made at different times.

SYSTEM REPORTS

On PC Labs' tests, *Virus-Pro*'s printable analysis reports were thorough enough to detect every virus. Using a checksum and proprietary CRC-like approach, it reports on boot sectors; partition tables; file at-

tributes, sizes, and creation dates; system paths; and interrupt vectors. If there are any mismatches, the program indicates which files were changed and how. It flags suspect changes and leaves you to account for the mismatches.

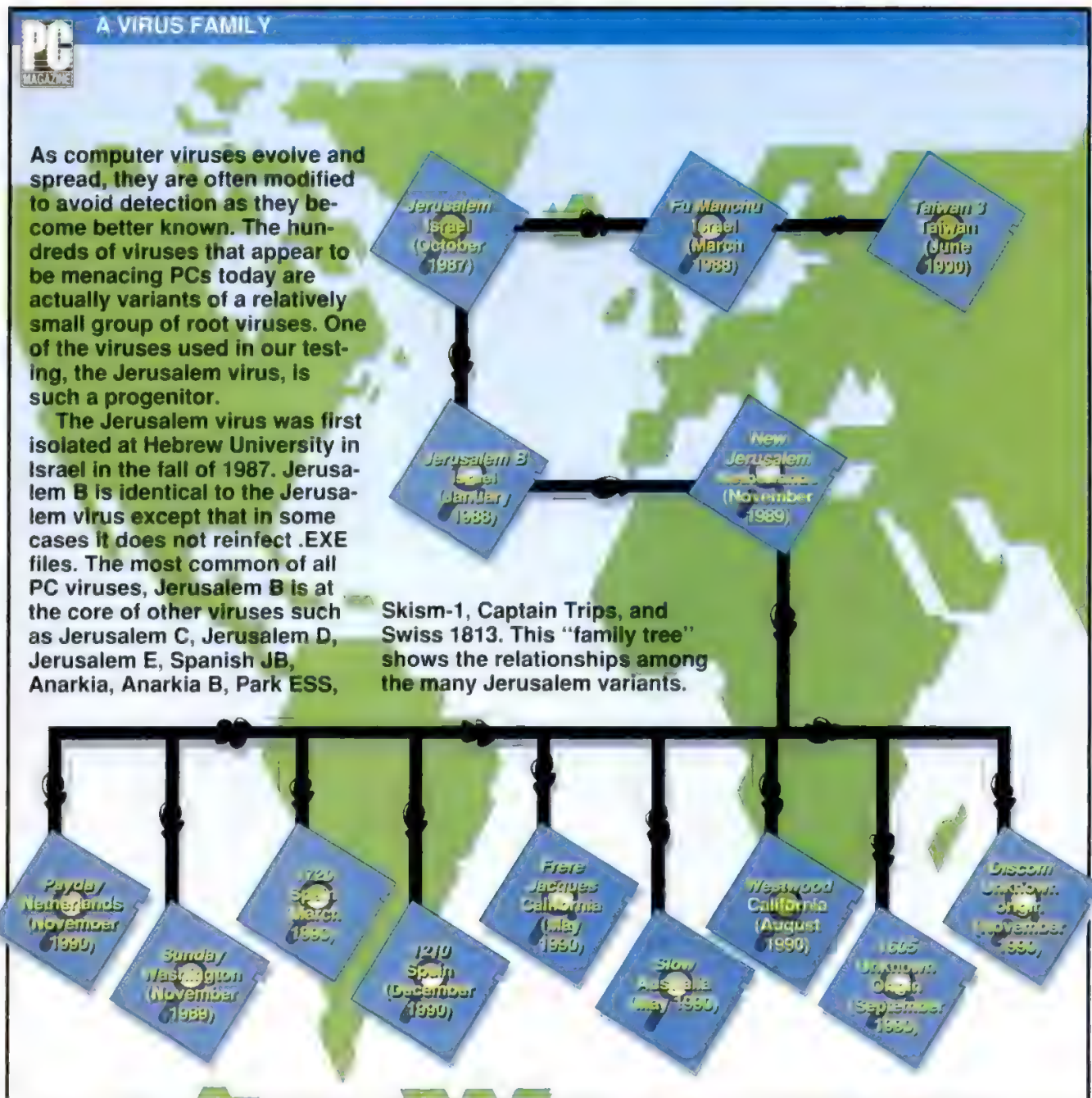
To cull the maximum benefit from *Virus-Pro*, you need to start out with a clean system and make regular backups. MIS managers who have the additional resources to remove or repair data contamination will appreciate the detailed

reports *Virus-Pro* generates. But individual users who need to scan new floppy disks for viruses and recover infected files on their own should look for more in an antivirus package.

Virus Secure for Windows

by John R. Quain

The main attraction of *Virus Secure for Windows* is in the name. It's the first and





Wouldn't it be nice to have a modem that ran faster yet didn't cost an arm and a leg?

That's precisely what the new V.32 OPTIMA™ 96 is all about.

It delivers 9600 bps connections and up to 38,400 bps throughput. It features V.42 error-control, V.42bis data compression, and it's compatible with MNP levels 2 through 5.

The OPTIMA 96 has all of the features you

need for easy communications with PCs, mainframes, and all types of on-line services and bulletin boards. It even negotiates the best connection automatically.

To get you up and running right out of the box, every OPTIMA 96 modem comes complete with Hayes Smartcom EZ communications software. Plus special offer coupons good for software upgrades and on-line connections.

All of this for a remarkably low price.

Anything else on your mind? If so, please call us at 1-800-635-4225 for our fully detailed OPTIMA 96 brochure.

Our technology has the computer world talking. More than ever.



CIRCLE 136 ON READER SERVICE CARD

Introducing the modem that knows where your head is at.

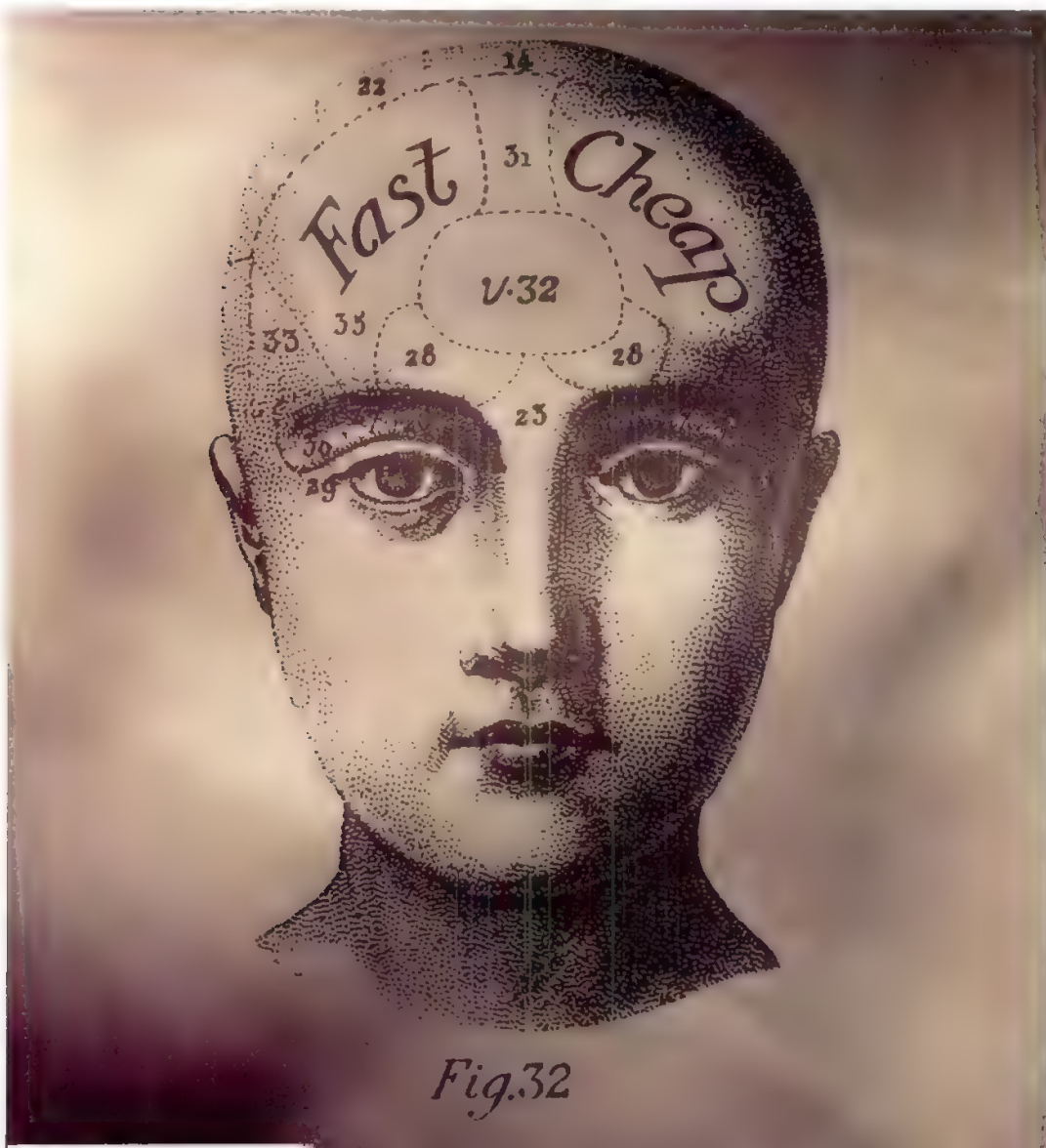


Fig.32

***Virus Secure* is
meant to be used to
scan unfamiliar
floppy disks.**

only antivirus package designed as a *Microsoft Windows* 3.0 application. This \$95 package from Abacus is designed to check floppy disks for viruses and occasionally check hard disks, but if your system is already infected and *Windows*—which is sensitive to viruses—is disabled, *Virus Secure* won't be able to help.

Virus Secure's approach to virus prevention and elimination is conservative. Since TSRs can invite infection, there's no memory-resident detection program. And its primary method of removing a virus is to delete infected files to avoid further damage. There's also an option to restore damaged boot sectors.

COMPARING CONTROL FILES

Virus Secure is simple to install and operate. Either click on VSPWIN.EXE in the File Manager or install it through the *Windows* Setup and the VSPWin icon is automatically placed in the *Windows* Applications group. The program uses a control (or verification) file to track file sizes, attributes, and creation times and dates on hard disks and floppy disks. A virus detector hunts for telltale virus byte strings. Together, the *Virus Secure* program and the control file filled only 188K of hard disk space on PC Magazine Labs' test system.

The program performs full or partial scans and control-file comparisons on a logical drive, directory, or per-file basis (including nonexecutable files). It also checks conventional memory, but only when *Windows* is run in Real mode. *Virus Secure* automatically updates its control log and maintains a list of excluded files. Scans can be slow, taking up to an hour to check a full 40MB hard disk. Since the program can run in the background, this unimpressive speed is only a minor irritant.

When you add a new application or upgrade your operating system, a window displays the message "New File!!" after each new entry. When an infection is



PERFORMANCE TESTS: ANTIVIRUS SOFTWARE

AntiVirus Plus and *Central Point Anti-Virus* did the best job of detecting, removing, and guarding against viruses. The two viruses that were most difficult to control proved to be the Red Cross and *PC Magazine's* own nondestructive *Totally Hidden Virus* commissioned for these tests.

HOW WE TESTED

The goal of our tests was to determine how effective each antivirus program is at handling four common viruses, one rare virus, and one new virus specifically designed for this test. We used three pass/fail evaluations to test

- the ability to detect a virus on a system that was infected before the antivirus program was installed;
- the ability to remove a virus from a system that was infected before the antivirus program was installed;
- the ability to protect the system from a virus attack after the antivirus program is installed.

For testing purposes, PC Magazine Labs used Compaq Deskpro 386/25s with 60MB hard disks and 8MB of extended RAM. The hard disks were partitioned as single drives under Compaq DOS 4.01. The hard disk was reformatted after each test except for the detection and removal tests.

After partitioning and reformatting the disks, we restored DOS and sample application and data files from write-protected backup floppy disks. There were 55 executable programs in 125 files and 2 subdirectories on the host system.

Out of the thousands of known viruses, we selected five representative types. The viruses and the valuable background information were obtained from David Grant of the PC Virus Research Foundation and from Patricia Hoffman (author of *Hypertext VSUM*). And in order to test the programs' abilities to guard against a completely new virus, we commissioned the PC Virus Research Foundation to write a virus specifically for our tests, called *Totally Hidden Virus*.

This virus was designed to circumvent common detection methods, and it successfully eluded several of the packages we tested. The code, which is harmless, has been closely guarded and will be made available only to the vendors whose products are tested here to help them in future product development.

A description of each virus follows.

THE VIRUSES

Cascade

Also known as 1701, Autumn, or Falling Letters, this virus is a RAM-resident, self-encrypting .COM file infector. When an infected program is run, Cascade loads itself into memory and replicates by adding 1,701 bytes of viral code to the end of any uninfected .COM file upon execution. If the virus infects COMMAND.COM, it will become resident when the system is booted or a DOS shell is loaded. If the system date is set between September and December of 1980 or 1988, the virus may drop all the letters on-screen into a heap at the bottom of the display. Cascade is usually harmless, but it occasionally hangs or reboots the PC, and one destructive variant reformats the hard disk.

Red Cross

Also known as Ambulance Car, this relatively rare strain infects .COM files. Since it is not memory-resident and strikes infrequently, Red Cross is difficult to detect. Whenever an infected program is run, the virus will search the C: drive directories and replicate itself in an uninfected .COM file. The virus normally infects only one .COM file per directory, usually not the first one. Thus, COMMAND.COM is avoided since it is ordinarily the first .COM file in the root directory. Occasionally when an infected file is run, Red Cross will blare a siren and display an ambulance driving along the bottom of the screen. This effect occurs only on systems with a graphics display adapter. The virus is a nuisance but does not do any serious damage.

Dark Avenger-B

This variant of Dark Avenger installs itself in memory and is particularly virulent, attaching itself to any .COM, .EXE, .SYS, or overlay file as soon as it is opened. Infected files are lengthened by 1,800 bytes. After every sixteenth infection, Dark Avenger will write "Eddie lives....Somewhere in Time!" to a random sector on the disk. This virus is harmful since any program or data file using the overwritten sector is irretrievably damaged.

Stealth

Also called 4096, FroDo, the Century Virus, and 100 Years, this destructive virus attacks .COM, .EXE, .SYS, overlay, and even some data files by installing itself as a TSR and intercepting DOS interrupts. Like Dark Avenger, it infects files as soon as they are opened. The Stealth virus is devious; its management of DOS functions makes it almost invisible. While the virus is in memory, the directory listing will appear normal even though 4,096 bytes are added to infected

files. The Stealth virus also attacks the file allocation table (FAT), slowly cross-linking files and tricking programs like CHKDSK into causing further damage by changing the apparent number of available sectors. Between September 22 and December 31 of any year, the Stealth virus will hang infected systems because of a bug in the viral code. It is particularly malicious, eventually rendering an infected system unusable. Files lost through cross-linking cannot be recovered.

Joshi

Joshi is a memory-resident boot-sector and partition-table infector. It loads itself into memory whenever a user attempts to boot from an infected disk. Once in memory, the virus replicates itself in the boot sector or partition table of any attached disks and moves the original contents to another location on each disk. It will spread regardless of whether or not the attached disk is bootable. Joshi eludes detection by intercepting and redirecting boot-sector or partition-table read requests, making the disk appear normal. It can even survive a warm boot (Ctrl-Alt-Del) from an uninfected floppy disk by remaining in memory rendered unavailable to DOS. On January 5, the virus will display a message and lock the system until the user types "Happy Birthday Joshi." Joshi damages non-standard hard disks and floppy disks that do not use the 360K format.

Totally Hidden Virus

This virus is a self-encrypting, non-memory-resident .COM infector. It will not infect COMMAND.COM or any nonstandard .COM files. Totally Hidden Virus, which is non-destructive, was created specifically for this article in order to test the antivirus programs' abilities to detect an original virus. It was developed by David Grant and Daniel J. Karnes of the PC Virus Research Foundation and contained code that made it active only for the two-week period when testing was conducted; after that period, it became permanently dormant.

When an infected program is run, Totally Hidden Virus searches the directory tree and transfers itself to another .COM file, displaying the PC Magazine logo and a message from the PC Virus Research Foundation. Totally Hidden Virus is also totally harmless; after transferring to a new file, it removes itself from the infected file.

VIRUS DETECTION

The **Virus Detection** test is a pass/fail exercise that shows if the antivirus product can detect a virus on an infected system. We install the software on a write-protected floppy disk, infect the hard disk with the sample virus, and run the virus detection program from the protected floppy disk

The product passes if it identifies the virus by name or if it correctly identifies the files or parts of the system that are infected.

VIRUS REMOVAL

The **Virus Removal** test is a pass/fail exercise that shows if the antivirus product can effectively remove a virus from an infected system. We install the software on a write-protected floppy disk, infect the hard disk with the sample virus, and run the virus removal program from the protected floppy disk. The product passes unequivocally if it removes or permanently deactivates the virus and restores infected parts of the system to working order.

Conditional passes are granted to products that remove the virus by destroying infected parts of the system.

VIRUS PROTECTION

The **Virus Protection** test is a pass/fail exercise that shows if the antivirus product can effectively protect a system from a virus infection. We install the software on the hard disk and configure it for maximum protection as recommended by the manufacturer. Then we attempt to infect the hard disk from a virus-contaminated floppy disk. The product passes if it prevents the virus from infecting the system or if it removes the virus immediately after the virus installs itself. A **conditional pass** is granted to products that alert the user to the virus and provide enough information for the user to remove it effectively.

WHAT THE RESULTS MEAN

Our results prove that the old adage about an ounce of prevention is particularly true for computer viruses, especially when the cure destroys infected files. Although most of the products were able to detect common RAM-resident viruses on an infected system, they offered much better protection when antivirus software was installed prior to the virus attack. Several packages, when installed on a virus-free system, were able to prevent most of our viruses from entering the system altogether. This was true even for rare and unknown viruses such as Red Cross and Totally Hidden Virus. These viruses tended to elude detection scans partially because of their rarity, but also because they are not memory-resident. Stopping non-memory-resident viruses usually involves some form of file registry or checksumming, which must be performed on a clean system to be effective.

Central Point Anti-Virus and *AntiVirus Plus* were the best. They successfully prevented all of our viruses from invading the system in the Virus Protection test, and

Central Point Anti-Virus caught and removed all but Totally Hidden Virus on the Virus Detection and Removal tests.

AntiVirus Plus did almost as well but failed to notice the Red Cross virus.

Central Point Anti-Virus probably did better with Red Cross than *AntiVirus Plus* because its scanner was familiar with the particular strain we used. Several of the products that claim to catch Red Cross failed to identify it in our tests, demonstrating that viruses have a number of variants and scanners can only identify certain strains. This is why so many products failed to detect Totally Hidden Virus, a virus unknown to all of them. *Flu_Shot Plus*, *Mace Vaccine*, and *Panda Pro*, the only products that could detect it, apparently look for more generic traits.

Packages that use a wide variety of techniques to trap and remove viruses generally fared best, while single-strategy products such as *SafeWord Virus-Safe*, *Virus Guard*, or *Virus-Pro* revealed their limited utility. *Certus* was impressive on the Virus Protection test, successfully guarding the system against all of our virus attacks, but its assumption that a user would only install it on a virus-free system had some drawbacks. The product cannot be installed on a floppy disk, so in order to run the Virus Detection and Removal tests we had to install it on an infected hard disk. During installation, *Certus* itself became infected and promptly deleted itself from the system.

The least effective product was the Microsoft Windows-based *Virus Secure* for Windows, mainly because Windows places antivirus utilities at a supreme disadvantage. Under most circumstances Windows won't operate on a virus-infected system. We could not perform the Virus Detection and Removal tests on *Virus Secure* since those tests called for the system to be infected prior to running the tests, and it was virtually impossible to install *Virus Secure* on an infected hard disk. We ran the Virus Protection tests, but since *Virus Secure* is essentially a non-resident scanner, it cannot stop viruses from infecting the system. Windows almost always became infected and crashed most of the time. It usually would not run in 386 Enhanced mode or Standard mode, but even in Real mode, UAEs and other problems forced us to rerun the tests several times. Eventually, we discovered that *Virus Secure* could detect Cascade, Red Cross, and Joshi viruses, but because of the unreliability of the results, we had to disqualify the product on the Virus Detection test.

Going back to

1990 World Class Award for
Best Mail-Order Company



☐ 3 1/2" format available from us. Specify when ordering.

☐ package includes both 5 1/4" and 3 1/2" disks.

☐ 3 1/2" format available from manufacturer by request. Call us for details.

CP—copy-protected; NCP—not copy-protected.

The four-digit number next to each product is the product's ITEM NUMBER. Please refer to this number when ordering. Thank you.

SOFTWARE

We only carry the latest versions of products. Version numbers in our ads are current at press time.

Products listed here in red are Microsoft Windows Applications

Adobe Systems ... NCP

7547	Adobe Type Manager 1.1 for Windows	\$59
9623	Adobe TypeAlign 1.0 for Windows	69
	Adobe TypeSets for Business	ee 95.
9874	Adobe TypeAlign 1.0 w/ATM	125
7928	Adobe Plus Pack 1.0	129
8367	ATM & Plus Pack Bundle	169.
7392	Adobe PostScript Cartridge (with choice of FREE Type Cartridge 1 or Type Cartridge 2)	299

(Entire Adobe Type Library, from 1 to 220 is available. Call for more information.)

Aldus ... NCP

8000	Persuasion 2.0 for Windows	339
1332	PageMaker 4.0	499

Application Techniques ... NCP

1214	Pizazz Plus 2.0	69.
9621	Picture Eze 1.0 for Windows	99

Artisoft ... NCP

2455	Lantastic EtherNet Starter Kit (includes software, 2 EtherNet cards, cable)	495.
2452	EtherNet Adapter Card	209.
2454	EtherNet Microchannel Starter Kit	649.

Ashton-Tate ... NCP

4450	dBASE IV 1.1	499.
------	--------------	------

Asymetrix ... NCP

7384	Toolbook 1.5 for Windows	299
------	--------------------------	-----



Lotus ... NCP

2747 ☐ 1-2-3 for Windows & Ami Pro 2.0 "Double Up" Upgrade—Upgrade from any PC release of 1-2-3 or any Lotus word processor to both 1-2-3 for Windows and Ami Pro 2.0! Through December 31, 1991 you can upgrade to the "world's most popular spreadsheet" and the "most highly acclaimed word processor" in one package. You'll receive full software and documentation for both products, plus a booklet titled "Working Together" which describes how to use 1-2-3 for Windows and Ami Pro 2.0 together \$159.

UPGRADES NOW AVAILABLE

Atech Software ... NCP

9436	Publisher's Powerpak 1.2 for Windows	49
9435	Publisher's Powerpak 2.1 for WordPerfect & Microsoft Word	49.

Automap ... NCP

2729	Automap 1.0	52.
------	-------------	-----

Avery ... NCP

6006	Label Pro 1.0 (Laser)	49.
7336	Label Pro 1.0 for Dot Matrix	49.
1600	Avery 1st Impression	229.

Berkeley Systems ... NCP

9885	After Dark 1.0 for Windows	29
------	----------------------------	----

Better Software ... NCP

9786	Switch-It 3.23	55.
------	----------------	-----

Bitstream ... NCP

7568	FaceLift 1.2 for Windows 2 x/3.0	59.
8040	FaceLift 1.5 for WordPerfect 5.0/5.1	59.
7569	Companion Value Pack 1.0	125.
8883	Type City Cartridge with Deli.	259.
	Typeface Packages	each 89.

Borland International ... NCP

6242	Quattro Pro 3.0	339.
9695	Borland's C++ 2.0	339.
1514	Paradox 3.5	529.
7356	Pascal Pro (2nd Edition)	209.
9635	Object Vision 1.0	call

Broderbund ... NCP

1434	New Print Shop	39.
------	----------------	-----

ButtonWare ... NCP

6419	PC-File 6.0	89.
------	-------------	-----

Caere ... NCP

8933	Omnipage Professional 1.0	669
	Central Point ... NCP	
5039	PC Tools 7.0	115.
8114	Backup 7.0 (DOS and Windows)	84
1675	Commute 1.0	84.
9751	AntiVirus 1.0	84.

Chronologic Corporation ... NCP

8849	Instant Recall 1.2	64.
------	--------------------	-----

CompuServe ... NCP

7546	DOS Membership Kit 1.3	23.
------	------------------------	-----

Concentric Data Systems ... NCP

6575	R & R Relational Report Writer 4.0	159.
------	------------------------------------	------

Contact Software ... NCP

1625	ACT! 2.0	229.
------	----------	------

Corel Systems ... NCP

5506	CorelDRAW! 2.0	389
------	----------------	-----

Data Storm ... NCP

4798	PROCOMM PLUS 2.0	69.
------	------------------	-----

Deirina Technology ... NCP

2446	WinFax Pro 2.0	75.
7351	PerFORMPRO 1.0	179

Digital Research ... NCP

9694	DR DOS Upgrade to 5.0	39.
------	-----------------------	-----

DMA ... NCP

8378	PC Anywhere IV 4.03	105.
------	---------------------	------

Fifth Generation Systems ... NCP

7725	Direct Access 5.1	65.
3950	Fastback Plus 3.0	119.

Fox Software ... NCP

6188	FoxPro 2.0	489.
------	------------	------

Funk Software ... NCP

9488	Sideways 3.3 & P.D. Queue 1.0	85.
------	-------------------------------	-----

Geoworks ... NCP

8789	Ensemble 1.2	129.
------	--------------	------

Gibson Research ... NCP

9832	SpinRite II 2.0	64.
------	-----------------	-----

Great American Software ... NCP

9827	Money Matters 2.0 & Payroll 2.0	99.
------	---------------------------------	-----

4880	One Write Plus Acct. Sys. 2.06	179.
------	--------------------------------	------

Hayes ... NCP

7983	Smartcom Exec 2.0	79.
------	-------------------	-----

9639	LANstep 1.0	349.
------	-------------	------

hDC Computer Corporation ... NCP

7383	First Apps 1.0	52
------	----------------	----

Helix Software ... NCP

9627	Netroom 2.0 (single user)	52.
------	---------------------------	-----

Hilgraeve ... NCP

8204	HyperACCESS/5.2.0 (DOS)	59.
------	-------------------------	-----

IBM ... NCP

2666	DOS 5.0 Upgrade	59.
------	-----------------	-----

2669	Hollywood 1.0 for Windows	319.
------	---------------------------	------

Individual Software ... NCP

6222	Resume Maker 1.3	29.
------	------------------	-----

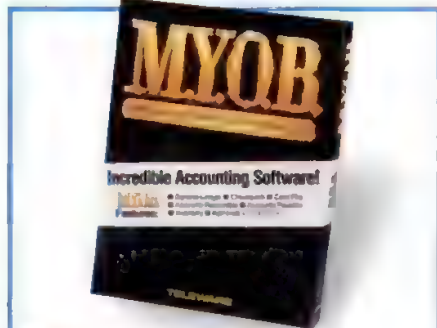
Inner Media, Inc. ... NCP

8846	Wide Angle 1.0 for Windows	69
------	----------------------------	----



Berkeley Systems ... NCP

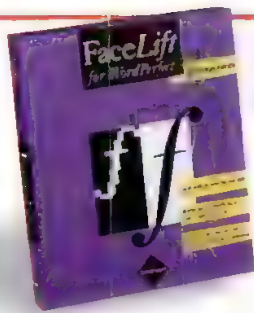
After Dark 1.0 for Windows—Prevent screen burn-in with over 35 incredible displays—Aquatic Realm, Flying Toasters, Logo, Messages, Multumodule or create your own. Features DOS blanking, password protection & SOUND! \$29.



Teleware ... NCP

MYOB for Windows—Incredible Accounting Software for Windows. M.Y.O.B. contains full-featured G/L, A/R, A/P, Inventory and Card file. The hottest selling program for the Mac is now available for PC users . \$139.

get a degree?



Bitstream ... NCP

8040 ☐ FaceLift 1.5 for WordPerfect 5.1/5.0—Fast, easy-to-use & makes great fonts for dot matrix, inkjet, HP Deskjet, Laserjet & compatible printers. 16 typefaces for WordPerfect 5.1/5.0, LetterPerfect 1.0 & PlanPerfect 5.1/5.0... \$59.

Inset Systems ... NCP

7298 ☐ HiJaak 2.0 99.
7300 ☐ Inset Plus HiJaak 125.

Insight Development ... NCP

8320 ☐ PrinTools 1.0 85.

Intuit ... NCP

2426 ☐ Quicken 4.0 39.
2474 ☐ Quicken with QuickPay 65.

LaserTools ... NCP

6882 ☐ PrintCache 2.4 99.
2656 ☐ Printer Control Panel 1.0 99.

Lotus ... NCP

5417 ☐ 1-2-3 3.1 Plus 429.
5653 ☐ 1-2-3 2.3 349.
1852 ☐ 1-2-3 2.3 Upgrade 95.
2755 ☐ 1-2-3 for Windows 1.0 419.
2747 ☐ 1-2-3/W and Ami Pro Upgrade 159.
5799 ☐ Ami Pro 2.0 309.
1847 ☐ Ami Pro Competitive Upgrade 119.
1621 ☐ Freelance Graphics 4.0 for DOS 329.
2750 ☐ cc:mail DOS Platform Pack 125.

MECA ... NCP

2798 ☐ Managing Your Money 7.0 99.



Great American Software ... NCP

4880 ☐ One-Write Plus Accounting System 2.06—Based on the one-write manual system. Incl. General Ledger with Checks & Receipts, Receivables w/Invoicing, Payables, & SuperTrack, a customizable tracking feature. \$179.

Micro Logic ... NCP

6787 ☐ Info Select 2.0 \$95.

Microcom ... NCP

7649 ☐ Virex-PC 2.0 79.
6234 ☐ CarbonCopy Plus 6.0 119.
2718 ☐ Relay Gold for Windows 239.

Microlytics ... NCP

9636 ☐ Strunk & White Elements of Style 1.0 35.
7931 ☐ Random House Encyclopedia 1.0 68.

Microsoft ... NCP

2894 ☐ QuickBasic 4.5 69.
7010 ☐ Windows 3.0 99.
7388 ☐ Project 1.0 for Windows 459.
2904 ☐ Works 2.0 99.
2735 ☐ Works for Windows 2.0 139.
2901 ☐ Word 5.5 209.
7387 ☐ PowerPoint 2.0 for Windows 329.
6195 ☐ Word 1.1 for Windows 329.
2856 ☐ Excel 3.0 for Windows 329.
8137 ☐ Office for Windows 499.
2853 ☐ C Compiler 6.0 329.
1620 ☐ DOS 5.0 Upgrade 65.
1624 ☐ Visual Basic 1.0 139.



Corel Systems ... NCP

CorelDRAW! 2.0—The PC graphics software that's fast, fun and powerful. CorelDRAW! 2.0 now comes with more drawing power, more type control, and more value...and it's still easy to use \$389.

Multisoft ... NCP

4925 ☐ PC-Kwik Power Pak 2.1 75.

Nolo Press ... NCP

5122 ☐ For The Record 2.0 35.
2982 ☐ WillMaker 4.0 39.

Norton-Lambert ... NCP

2753 ☐ CloseUp for Windows & DOS Dual Pack 135

OCR Systems ... NCP

9878 ☐ ReadRight 3.0 for Windows 309.

Okma ... NCP

9696 ☐ Desktop Set 3.0 for Windows 85.

PC Globe ... NCP

5902 ☐ PC Globe 4.0 45.
5945 ☐ PC USA 2.0 95.

Personics ... NCP

9288 ☐ Laptop Ultravision 2.1 (3 1/2" only) 49.
4384 ☐ Ultravision 2.0 79.

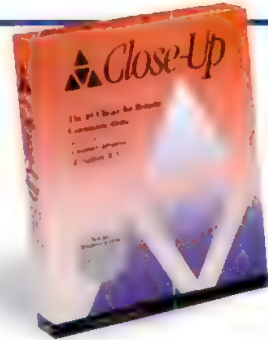
1-800/243-8088

MMC
MasterMind Computing

PC Connection
6 Mill Street
Marlow, NH 03456

890M

SALES 603/446-7721 FAX 603/446-7791



Norton-Lambert ... NCP

2753 ☐ CloseUp for Windows & DOS Dual Pack 4.0—New! View and operate PCs miles away via modem. Give instant Windows and DOS support to customers at any location. VGA/EGA graphics intro. price \$135.

PowerUp ... NCP

7860 ☐ Calendar Creator Plus 4.0 52.
7857 ☐ Labels Unlimited 3.0 59.
7858 ☐ Express Publisher 2.0 89.
9332 ☐ Form Publisher for Windows w/Fill & File 109.

Qualitas ... NCP

7539 ☐ 386MAX 5.12 (w/ASQ) 75.
7967 ☐ BlueMAX 5.12 for PS/2 (3 1/2" only) (w/ASQ) 85.

Quarterdeck ... NCP

3221 ☐ Expanded Memory Mgr. 386 5.1 65.
3220 ☐ DESQView 2.3 85.
4586 ☐ DESQView 386 2.3 145.

QUE Software ... NCP

4155 ☐ RightWriter 4.0 54.
1857 ☐ RightWriter 4.0 Network 169.

Reality Technologies ... NCP

7891 ☐ WealthStarter 1.0 39.
6572 ☐ WealthBuilder 1.1 99.

Reference Software ... NCP

4396 ☐ Grammatik IV 2.0 59.
7483 ☐ Grammatik for Windows 2.0 59

Roykore ... NCP

2473 ☐ Instant ORG Charting! 1.0 125
8162 ☐ ABC Flowchart 1.1 189

Sitka ... NCP

6675 ☐ TOPS Network Bundle 3.0 159.
3720 ☐ Flashcard 2.1 (AppleTalk network card) 155.

Softlogic Solutions ... NCP

3542 ☐ Software Carousel 5.0 55.

Software Publishing ... NCP

3496 ☐ Professional Write 2.2 169.
9638 ☐ Professional Write Plus 1.0 169
3482 ☐ Harvard Graphics 3.0 419.
6600 ☐ Superbase 4 for Windows 1.3 429

Software Toolworks ... NCP

9859 ☐ Word for Word/Windows 4.2 47.

Solution Systems ... NCP

7977 ☐ Brief 3.1 (Programmer's Editor) 189.

Spinnaker ... NCP

1415 ☐ PFS WindowWorks 1.0 129
7604 ☐ PLUS for Windows 2.0 289

Stac Electronics ... NCP

1409 ☐ Stacker 1.1 89.

Symantec ... NCP

6397 ☐ The Norton Backup 1.2 (Windows/DOS) 89
3146 ☐ The Norton Utilities 6.0 119.
3425 ☐ Q&A 4.0 269.
7999 ☐ Norton Anti-Virus 1.0 89.
2359 ☐ The Norton Desktop for Windows 105.

PC CONNECTION®

Add some class



TIMESLIPS ... NCP

2987 ☐ Timeslips III 4.0—Know exactly who owes you what with this time and expense billing system. Perfect for service professionals (accountants, lawyers, etc.) who need to track and bill their time. \$195.

Systems Compatibility ... NCP

- 9046 ☐ Complete Writer's Toolkit 1.1 85.
6564 ☐ Software Bridge 5.0 79.

Teleware ... NCP

- 9847 ☐ M Y O B for Windows 139
TIMESLIPS ... NCP
2987 ☐ Timeslips III 4.0 195.
1270 ☐ TimeSheet Pro 2.0 145.

Timeworks ... NCP

- 6253 ☐ Publish-It! 2.0 139.

T/Maker ... NCP

- 1051 ☐ Color Graphics Presentation 1.0 95.
☐ ClickArt (EPS and Bitmap available) ... call

Touchstone Software ... NCP

- 7420 ☐ Check It 3.0 89.

Traveling Software ... NCP

- 5179 ☐ LapLink III 3.0 95.

WordPerfect Corporation ... NCP

- 7781 ☐ LetterPerfect 1.0 129.
4214 ☐ WordPerfect Office PC 89.
3804 ☐ WordPerfect 5.1 265.
6685 ☐ DrawPerfect 1.1 279.

WordStar International ... NCP

- 1482 ☐ Correct Grammar 1.0 for Windows 65
6791 ☐ WordStar Professional 6.0 199.

XTREE ... NCP

- 1202 ☐ XTree Easy 1.0 45.
6161 ☐ XTree Gold 2.0 95.

Z-Soft ... NCP

- 1626 ☐ Publisher's Paintbrush for Windows 299



Inset Systems ... NCP

7298 ☐ Hilaak 2.0—Capture screens & convert graphics files with Hilaak release 2.0. New features include 5K pop-up window, many new raster & vector formats and support for more than 16 Group 3 fax devices. \$99.

RECREATIONAL/EDUCATIONAL

Broderbund ... CP

- 8068 ☐ Where in World is Carmen Deluxe. . . \$52.
1836 ☐ Where in America's Past is
Carmen Sandiego 39.
5851 ☐ SimCity 33.
8886 ☐ SimEarth 45.

Electronic Arts ... NCP

- 4534 ☐ Mavis Beacon Teaches Typing 1.0 (CP) 35.
1334 ☐ Chuck Yeager Air Combat Trainer 42.

Harvard Associates ... NCP

- 2324 ☐ PC Logo 3.0 59.

HyperGlot Software ... NCP

(French, German, Italian, Spanish available.)

- ☐ Word Torture for Windows ea. 34.
☐ Word Torture 3.0 ea. 29.

Microsoft ... NCP

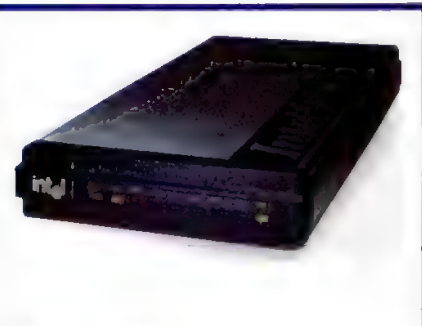
- 7881 ☐ Entertainment Pack for Windows 1.0 29.
2858 ☐ Flight Simulator 4.0 39.
8270 ☐ Aircraft and Scenery Designer 1.0 29.

Microsoft Press (Books)

- 8129 Running Windows (2nd Edition) 22.
8136 Running Microsoft Excel 22.

Penton Overseas ... NCP

- ☐ VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) each 35.



Intel ... 5 years

7880 9600EX Modem—Provides ultra-fast data communications without sacrificing compatibility. Supports V.32 & V.42bis 9600 bps operation, as well as MNP Level/5 and Hayes compatible 2400/1200/300 bps modes. \$529.

Sierra ... CP

- 9466 ☐ Space Quest IV (VGA) 39.
7972 ☐ King's Quest V (VGA) 45.

Software Toolworks ... NCP

- 4659 ☐ Chessmaster 2100 (CP) 35.
7372 ☐ World Atlas 2.0 42.

Stone & Associates ... NCP

- 3439 ☐ 2nd Math 4.2 27.

Toyogo ... NCP

- 7676 ☐ Nemesis Go Master Deluxe 4.7 88.

True BASIC, Inc. ... NCP

- ☐ Kemeny/Kurtz Math Series each 45.

Walt Disney Computer Software ... CP

- 2629 ☐ Mickey's 123's 35.
2624 ☐ Mickey's ABC's 35.

HARDWARE

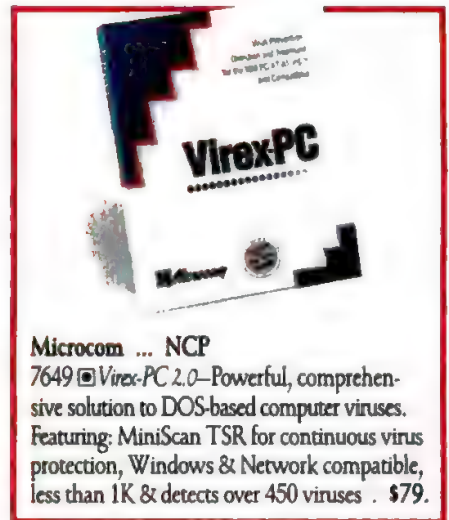
Warranties listed next to manufacturer.

Acme/SAFE Power Systems ... 2 years

- 1948 Safe 300 199.
6747 Safe 400S 399.

American Power ... 2 years

- 7108 Smart UPS 400 339.
7105 Smart UPS 600 469.
6811 Back-UPS 360 219.
7106 Back-UPS 520 329.



Microcom ... NCP

7649 ☐ Virax-PC 2.0—Powerful, comprehensive solution to DOS-based computer viruses. Featuring: MiniScan TSR for continuous virus protection, Windows & Network compatible, less than 1K & detects over 450 viruses. \$79.

ATI Technologies ... 2 years

- 9821 VGA Basic-16 (640 x 480, 16 colors) 85.
9629 VGA Wonder XL (256K upgradable to 1MB) 199.
2382 Graphics Vantage VGA (w/1 MB) 429.
1838 Graphics Ultra w/VGA (512K) 479.
2012 Graphics Ultra w/VGA (w/1 MB) 619.
1825 2400etc/i Modem (w/9600 SendFax) 139.
9620 9600etc/e Modem 379.

Boca Research ... 5 years

- 7001 BOCARAM/AT PLUS (OK) 119.
7150 BOCARAM/AT PLUS (2 MB) 219.
7139 (4 MB) 329. 7138 (8 MB) 539.
6998 I/O Board for AT 59.
6999 I/O Board for Microchannel (S/S/P) 109.
8380 BasicVGA (256K, 640 x 480) 63.
8381 SuperVGA (1 MB, 1024 x 768) 145.

Bravo Communications ... 2 years

- 7400 2 Position Laser Compatible Switch Box. 109.

Brown-Wagh ... 1 year

- 8578 Creative Labs Sound Blaster 159.
2336 Creative Labs Sound Blaster Pro 199.

Care ... 1 year

- 8158 Typist 399.

Canon ... 1 year

We are an authorized Canon Service Center.

- 7894 BJ-10e Printer with free case (4.6 lb.) 329.
7897 BubbleJet Ink Cartridge (BJ-10e) 23.
7896 BJ-10e Sheet Feeder 75.

Cardinal ... 1 year

- 2720 MB2450 Internal 2400 Baud Modem 69.
2719 MB2296SR Internal Send/Receive Fax 109.
2721 VGA732 True Color Ultra VGA Card 169.

CH Products ... 1 year

- 7801 FlightStick w/Falcon 49.

CoStar ... lifetime

- 1418 AddressWriter Envelope Printer 469.
1812 LabelWriter II Printer 195.

Curtis ... lifetime

- 1708 Ruby-Plus SPF-2 65.
7358 Command Center SPF-4 89.
Glass Filter Plus (specify size) each 65.

Cyrix Corporation ... 5 years

MATH COPROCESSORS

- 9875 FasMath 83D87-25 185.
9876 FasMath 83D87-33 195.
9877 FasMath 83S87-16 (SX compatible) 115.

Datadesk ... 3 years

- 6901 Switchboard (modular keyboard) 159.

Epson ... 2 years

We are an authorized Epson Service Center.

- 1906 FX-850 (80 col., 264 cps, 9 pin) 309.
1904 FX-1050 (136 col., 264 cps, 9 pin) 439.
2358 LQ-570 (80 col., 252 cps) 289.
2361 LQ-870 (80 col., 330 cps) 489.
2357 LQ-1170 (136 col., 330 cps) 669.
5184 LX-810 (80 col., 180 cps, 9 pin) 185.

to your PC!



Intel ... 5 years

80387 Math CoProcessors—Get the most out of your 80386 or 80386SX system with a genuine Intel Math CoProcessor. Order by 10/31/91 and get a free copy of Intel's Official Guide to 386 Computing... see line listings.

Everex ... 1 year		
1683	Tempo LX Notebook (5 MB, 60 MB HD)	3499.
Hauppauge Computer ... 1 year		
9031	20 MHz 386 Motherboard for PC	995.
9032	20 MHz 386 Motherboard for XT	995.
9870	25 MHz 386 Motherboard for AT	1099.
9034	33 MHz 386 Motherboard for AT	1339.
Hayes ... 2 years		
2307	Smartmodem 2400	349.
7391	Ultra 96 Modem	669.
9884	Pocket Edition 2400	129.
Hewlett-Packard ... 1 year		
9993	LaserJet IIIP (with toner)	1149.
6754	LaserJet III (with toner)	1679.
1959	LaserJet Fax	1399.
Hitachi ... 2 years		
9492	14MVX/LMF 14" SVGA Monitor (1024 x 768) (with low radiation screen)	489.
Intel ... 5 years		
6421	2400B MNP Internal Modem	199.
5119	2400 Baud External Modem	179.
6420	2400EX MNP Modem	229.
7880	9600EX Modem	529.
7552	Netport	489.
2346	Inboard 386/PC with 1 MB	495.
5336	Above Board Plus 8 2 MB	449.
5342	Above Board Plus 8 I/O 2 MB	479.
7782	SatisFAXtion (fax board)	399.
8778	SatisFAXtion for Microchannel	449.
8901	Matched Memory 2 MB (PS/2)	139.
8903	Matched Memory 4 MB (PS/2)	299.
	Matched Memory (for LaserJet IIP, III, IIIP IIID)	
1810	1 MB	99. 1787 2 MB
1637	Snap-In 386	389.
MATH COPROCESSORS		
7385	80287XL (16 MHz 80286 CPU's)	89.
4750	80387SX (16 MHz 80386SX CPU's)	129.
2372	80387-20 (20 MHz 80386 CPU's)	219.
4121	80387-25 (25 MHz 80386 CPU's)	219.
1811	80487SX	499.
Kensington Microware ... 1 year		
2582	Master Piece Plus	99.
7899	Expert Mouse serial	119. 7900 bus
		129.
Key tronic ... 3 years		
4518	101 Plus Keyboard	99.
Kraft ... 5 years		
5801	Game Card (2 ports)	27.
5800	3 button Thunder Joystick	29.
7862	TopTrak (Laptop Trackball)	55.

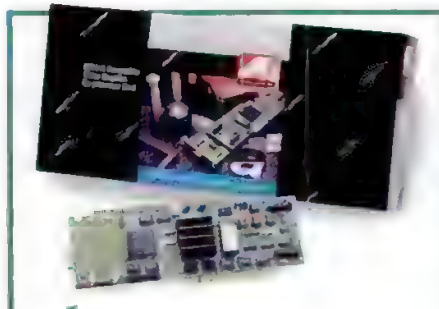
Logitech ... limited lifetime

6029	Trackman serial	\$75. 6028 bus	\$79.
2343	Trackman Portable		105.
1484	ScanMan 32		169.
7975	ScanMan 256		299.
8694	MouseMan (serial)	69. 9766 (cordless)	139.
Megahertz ... 5 years			
1193	T324D 2400 Modem (for Toshiba Laptops)		129.
1196	T224 2400 Modem (for Toshiba Laptops)		129.
1187	T324FM 96/24 Fax Modem (Toshiba Laptops)		299.
1199	T52CC - 2 MB Upgrade for Toshiba T1000 series or T2000SX		239.
Micron Technology ... 2 years			
7595	2 MB Expansion for HP LaserJet IIP or III		119.
7012	Memory Upgrade PS/2 70 - 2 MB		139.
Microsoft ... lifetime			
7597	Microsoft Mouse (bus or serial)		89.
2897	Mouse with Paintbrush (bus or serial)		105.
2898	Mouse with Windows 3.0 (bus or serial)		149.
1956	Mouse with Works (bus or serial)		155.
1896	Ballpoint Mouse (serial only)		119.
MicroSpeed ... 1 year			
	PC-TRAC Trackball		
6007	serial	75. 6008 bus	89.
7271	Import	79. 6330 PS/2	79.



Canon ... 1 year

7894 Bf-10e BubbleJet Printer—Light weight, excellent print quality and a great price make this 4.6 lb. printer a winner. Choice of black or white. Includes free carrying case. Optional sheet feeder available ... \$329.



ATI Technologies ... 2 years

Runs up to 10 times faster than IBM 8514/A. 1024 x 768 non-interlaced graphics and up to 256 colors. Scalable laser-quality screen fonts. 1833 Graphics Ultra VGA w/512k \$479. 2012 Graphics Ultra VGA w/1 MB 619.

Mouse Systems ... lifetime

5997	Trackball (1 yr. wrnty) serial	65. bus	69.
7878	PC Mouse III (serial)	89 (bus)	95.
NEC ... 2 years			
9441	CDR36 Portable CD-ROM Drive		399.
4799	Multisync 2A (VGA Monitor)		439.
5085	Multisync 3Ds Monitor		619.
Orchid Technology ... 4 years			
7863	ProDesigner VGA IIS (with 1 MB, includes RAMDAC chip)		289.
PC Power & Cooling ... 1 year			
REPLACEMENT POWER SUPPLIES			
3203	Turbo Cool 200		149.
7915	Turbo Cool 300		165.
7053	InnerSource 2210 (power backup)		349.

1-800/243-8088

MMC

PC Connection
6 Mill Street
Marlow, NH 03456

890M

SALES 603/446-7721 FAX 603/446-7791



Practical Peripherals ... 5 years

7934 PM9600SA Modem—Practical Peripherals does it again by making communications affordable with their newest modem featuring the data compression & error correction of 9600bps V.32 & V.42bis operation ... \$469.

We'll teach you how.

4542	2400 Baud Internal Modem for PS/2	\$229.
8132	PM2400 Pocket Modem	109.
2266	PM9600 Internal Modem	399.
7934	PM9600SA Modem	469.
2264	PM2400FX96 (modem/fax board)	145.
Targus ... lifetime		
1305	Universal Notebook (for ntbk. computers)	69.
TheComplete PC ... 2 years		
8082	Half Page Scanner/400 w/ReadRight	289.
5828	TheComplete Communicator	319.
Toshiba ... 1 year		
9893	T2000SX Notebook (40 MB)	2999.
9894	T1200XE Laptop (40 MB)	2099.
1779	T3100SX Laptop (80 MB)	3199.
1773	T3200SX Laptop (120 MB)	3499.
1765	T3200SXC Laptop (120 MB)	5899.
Tripp Lite ... 2 years		
6199	Isobar 4-6 (4 outlets, Gold Seal Warranty)	49.
6200	Isobar 6-6 (6 outlets, Gold Seal Warranty)	59.
6201	Isobar 8-12 (8 outlets, Gold Seal Warranty)	69.
6018	LC1200 (1200W line conditioner)	159.
1528	PS6.0 (600VA on-line UPS)	559.
Video 7 ... 7 years		
4931	VRAM II VGA 512k	259.
Zoom Telephonics ... 7 years		
1307	Int. 2400 Baud w/9600 Baud Fax Modem	109.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem	119.
1170	2400 Baud w/4800 Baud sendfax	69.
1181	2400 Baud V.42bis Modem (2 year)	159.
1167	2400 Baud Internal Modem	69.
1166	2400 Baud External Modem	85.
1494	9600 V.32 Turbo Modem (2 year)	399.



Zoom Telephonics ... 7 years
Provides send and receive fax at 9600 bps and a 2400 bps Hayes-compatible data modem. Includes fax and data communications software.
1307 Int. 2400 Baud w/9600 Baud Fax Modem \$109.
1178 Ext. 2400 Baud w/9600 Baud Fax Modem 119.

DRIVES

Conner Peripherals ... 1 year		
8875	CP3044 40 MB IDE HD (25 ms)	219.
2339	CP30104 120 MB IDE HD (19 ms)	399.
1337	CP3204 200 MB IDE HD (16 ms)	649.
IOMEGA ... 1 year		
We are an authorized Iomega Service Center.		
2224	Bernoulli II Transportable 90 MB	799.
2616	Internal 90 MB Bernoulli	799.
2500	PC2B Controller	209.
2530	90 MB Cartridge	149.
2467	90 MB Cartridge Tripack	439.
Mountain Computer ... 2 years		
2917	40-60 MB Internal Tape Drive	259.
5190	DC2000 Pre-formatted Cartridges	ea. 35.
6153	DC2120 Tape Cartridge (5 pack)	149.
Pacific Rim ... 1 year		
1304	1.2 MB External (for any parallel port)	265.
6602	1.44 MB External (for PC/XT/AT)	239.
Plus Development ... 2 years		
8304	Hardcard II XL 50 MB (9 ms)	399.
8287	Hardcard II XL 105 MB (9 ms)	599.

Seagate ... 1 year

4554	40 MB Internal HD ST251-1 (28 ms)	\$249.
1321	ST157A 40 Mb IDE Hard Drive	229.
1320	ST1144A 130 Mb IDE Hard Drive	475.

TEAC ... 1 year

4670	1.44 MB Drive for PC/XT (3 1/2")	69.
4326	1.44 MB Drive for AT (3 1/2")	89.
4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 MB Drive for AT (5 1/4")	75.

DISKS/MEDIA

Maxell ... lifetime

2789	5 1/4" MD2-D 360k Disks (Qty. 10)	10.
2790	5 1/4" MD2-D 1.2 Mb Diskettes (Qty. 10)	15.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
2793	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	21.



IOMEGA ... 1 year

2224 Bernoulli II Transportable 90 MB—Rugged and built to last, this drive will absorb 1000 g's of shock and provide 90 MB of portable storage. Awards from Byte and InfoWorld. Requires adapter card \$799.



Quarterdeck ... NCP

3221 Expanded Memory Manager 386 5.1—Gain up to 200K or more of previously unusable memory. Incl. automatic memory conversion, full compatibility with Windows, & speed optimization of memory (w Manifest)... \$65.

Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	8.
3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	11.
3298	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	18.
6148	3 1/2" DS/DD (3 Pack)	29.
6375	3 1/2" DS/HD (3 Pack)	49.
8185	QD 2040 Tape Cartridge	19.
1895	QD 2120 Tape Cartridge	22.
3M ... lifetime		
3943	DC 2000 Tape Cartridge	19.
6065	DC 2080 Tape Cartridge	25.
3944	DC 600 Tape Cartridge	29.
5679	DC 6150 Tape Cartridge	29.

MEMORY

6556	256k DRAM (100 ns, set of 9)	call
5510	1 MB x 9 SIMMs (80 nanosecond)	call
5746	1 MB Chips (80 ns, set of 9)	call
7813	256k x 4 Chips	call

OUR POLICY

- We accept VISA and MASTERCARD only.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$250 minimum. Manufacturer support and upgrade eligibility may be limited outside the U.S.A.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- COD max. \$1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us Monday through Friday 8:00 a.m. to 1:00 a.m., or Saturday 9:00 a.m. to 5:30 p.m. Eastern Time. You can call our business offices at 603/446-3383 Monday through Friday 9:00 a.m. to 5:30 p.m.



Hayes ... 2 years

7391 Ultra 96 Modem—Get ultra high modem performance & error control without sacrificing compatibility. Supports CCITT V.32, V.42bis, Express 96, MNP Level 2-5, & standard 2400/1200/300 bps communications... \$669.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd Day & Next Day-Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

Hawaii:

- For monitors, printers, Bernoulli Boxes, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add \$3 per order.

Alaska and outside Continental US:

- Call 603/446-7721 for information.



PC Cornucopia.

Oh my gourd!

What will they think of next?

It's time to preserve, pickle, and pack it in for the season up here in the glorified pumpkin patch of Marlow, NH (pop. 567). But even though there's a definite nip in the air, and we're tucking ourselves in tighter each night, we continue offering the freshest crop of PC products you'll find anywhere—not to mention service that's way more personal than any computer will ever be.

Our illustrious party animals have been adding a human touch to high tech for almost ten years now. But for newcomers it may be a little hard to see the Connection, so to speak. Well, it's simple—while we do have

the best combination of low prices, technical support, and fast shipping around, we're still just a bunch of country folk doing an honest day's (and often night's) work here in the woods of New Hampshire. Call anytime—whether you want the latest video display or a report on this year's apple crop.

A kernel of truth. (Or, let's not get too corny.)

Things will really start hopping around your office when you get your supply of PC Connection Popcorn on the Cob. We're sending some free to everyone who places an order for \$750 or more between now and December 31. Just put a cob in the bag, place it in your microwave, and out come three cups of popcorn. What an earful!



Lend you an ear? We'll give you 3 of them!
PC Connection Popcorn on the Cob. One batch per customer. Not available outside continental U.S.

PC CONNECTION®

COPYRIGHT PC CONNECTION, INC. 1991 PC CONNECTION AND THE RACCOON CHARACTER(S) ARE REGISTERED TRADEMARKS OF PC CONNECTION, INC. MARLOW, NH

SOFTWARE

ANTIVIRUS SOFTWARE



Virus Secure for Windows, Version 1.03
 Abacus, 5370 52nd St. SE, Grand Rapids, MI
 49512; 800-451-4319, 616-698-0330.
 List Price: \$95.
Requires: 640K RAM, DOS 3.0 or later,
 Microsoft Windows 3.0.
In Short: A simple program to use, *Virus
 Secure* is the first antivirus package written as
 a *Windows* application. It offers on-demand
 scans of conventional memory and disks.

CIRCLE 414 ON READER SERVICE CARD

detected, the program displays "Possible
 Virus?!" or "Contains Stoned Virus!",
 accompanied by loud beeps. And a dialog
 box lets you know if the way is clear.

OPERATIONAL TRAP

On PC Labs' tests, more often than not,
Virus Secure failed to operate, rendered

helpless in the face of attacks from the
 Dark Avenger and Stealth viruses. This
 was due to our testing procedures, which
 required us to infect systems intention-
 ally. But before *Virus Secure* can run, it is
 preceded by another unintentionally sen-
 sitive virus detector: *Windows* itself. The
 slightest infectious chill and *Windows*
 either froze, displayed "Protected Mode
 Violation" or "Unrecoverable Applica-
 tion Error," or hung the PC-curing *Virus
 Secure* scan.

We managed to detect some viruses by
 running a scan with *Windows* in Real
 mode, but *Virus Secure* earmarked the
 files infected by the Totally Hidden Virus
 as undergoing normal changes. *Virus Se-
 cure* is meant to be used to scan unfam-
 ilar floppy disks and make occasional
 checks on hard disks. Even when used in
 this manner, however, it allowed two of
 the viruses (Stealth and Totally Hidden
 Virus) to slip through.

Abacus updates virus signature files
 via a bulletin board service and provides
 over-the-phone (but not toll-free) techni-
 cal support. Given *Windows*' sensitivity
 to alien TSRs and file changes, *Windows*
 is more likely to register the presence of a

virus before *Virus Secure* can do anything
 about it.

Vi-Spy

by Henry Fersko-Weiss

Vi-Spy does a good job of detecting, cur-
 ing, and preventing most viruses as well
 as alerting you to activity that may indi-
 cate a virus attack. Its method of eliminat-
 ing viruses is to destroy infected files, a
 safe though disruptive approach. The
 program offers a limited number of run-
 time options and a command-line inter-
 face but no screens or menus, since its
 goal is to be as unobtrusive as possible. Its
 \$149.95 price is on the high side for
 single users, but RG Software Systems
 offers site licenses that bring the per-unit
 cost down.

COMPARING MAPS

The first time you run *Vi-Spy* you can
 create a memory map of your system, and
 in subsequent *Vi-Spy* sessions, the new
 map is compared with the previous one.
 You can examine the two maps together
 to examine any changes. If everything is
 okay you can save the new map; if not,

PERFORMANCE TESTS: ANTIVIRUS SOFTWARE

	VIRUS DETECTION						VIRUS REMOVAL	
	Cascade	Dark Avenger	Josh	Red Cross	Stealth	Totally Hidden Virus	Cascade	Dark Avenger
AntiVirus Plus	P	P	P	P	P	P	P	P
Central Point Anti-Virus	P	P	P	P	P	P	P	P
Certus*	P	P	P	F	P	F	CP	CP
Data Physician Plus	P	P	P	F	P	F	P	P
Dr. Solomon's Anti-Virus Toolkit	P	P	P	F	P	F	P	P
Flu Shot Plus	P	P	P	P	P	P	CP	CP
Mace Vaccine	P	P	F	P	P	P	P	P
The Norton AntiVirus	P	P	P	F	P	F	P	P
Panda Pro	P	P	F	P	P	P	P	P
SafeWord Virus-Safe*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vaccine	P	P	F	P	F	F	P	P
Virex-PC	P	P	P	P	P	F	P	P
VirusCide	P	P	F	F	P	F	P	P
VirusSafe	P	P	P	P	P	F	P	P
Viruscan	P	P	P	P	P	F	P	P
VirusCure Plus	P	P	P	F	P	F	P	P
Virus Guard*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Virus-Pro**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Virus Secure for Windows*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vi-Spy	P	P	P	P	P	F	CP	CP

N/A—Not applicable: The product is not designed to perform this function.

*—The product installs on a hard disk only.

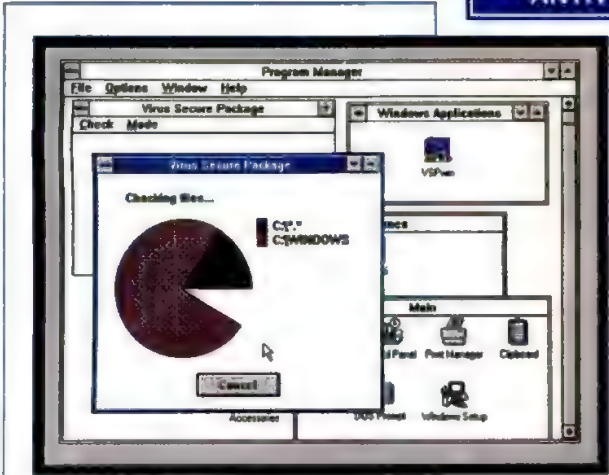
**—The product installs on a floppy disk only.

P—Pass.

CP—Conditional pass.

F—Fail.

SOFTWARE ANTIVIRUS SOFTWARE



Operating in its advanced mode under *Microsoft Windows 3.0*, *Virus Secure for Windows* lets you monitor its progress with a pie chart and a list of scanned directories.

your system may be infected by an unknown virus, and you need to reinstall the affected programs.

Vi-Spy also saves information on the boot sector and partition table, checksums on DOS system files, and the number of hidden files. All this is used to detect

possible viral activity. If your system is infected by a boot sector virus, *Vi-Spy's* VSRECOVER program uses this information to restore the boot sector and partition table.

Vi-Spy detects known viruses by searching memory and program files—entire files, not just beginning and end—for telltale signatures. If a virus is detected, *Vi-Spy* tells you which one

it is and then asks if you want to wipe and erase it.

TSR COMPANION

For maximum protection against viruses, *Vi-Spy* includes a memory-resident companion called *RVi-Spy*. It takes up only 4K to 5K RAM and invokes *Vi-Spy* whenever a floppy disk is first referenced by any DOS command. Therefore, the program rarely generates false alarms and never takes over large blocks of RAM. *RVi-Spy* also notifies you that a program has stayed in memory after completion or

**If a virus is
detected, Vi-Spy
tells you which one
it is and then asks
if you want to
wipe and erase it.**

that a program's size has changed while it was executing.

On PC Magazine Labs' tests, *Vi-Spy* did well in detecting and preventing viruses. The only virus it didn't catch was the Totally Hidden Virus, since the program doesn't save checksums on non-system files and has no other way of discovering an unknown virus.

Vi-Spy cannot repair files contaminated with a virus. RG Software Systems' philosophy is: The best cure for a virus is destruction of the infected files. This approach is unquestionably the safest, but it's also the most disruptive, forcing you to reinstall programs.

VIRUS PROTECTION									
Joan	Red Cross	Stealth	Totally Hidden Virus	Cascade	Dark Avenger	Joan	Red Cross	Stealth	Totally Hidden Virus
P	P	P	F	P	P	P	P	P	P
P	P	P	F	P	P	P	P	P	P
F	F	P	F	P	P	P	P	P	P
P	F	P	F	P	P	P	P	P	P
F	F	P	F	P	P	F	F	P	F
F	CP	CP	F	P	P	CP	P	F	P
F	P	P	P	P	P	F	P	P	P
F	F	P	F	P	P	F	F	P	P
F	P	P	P	P	P	F	P	P	P
N/A	N/A	N/A	N/A	CP	CP	CP	CP	F	CP
F	P	F	F	P	P	F	P	P	P
F	CP	P	F	P	P	F	CP	P	P
F	F	P	F	N/A	N/A	N/A	N/A	N/A	N/A
P	F	P	F	P	P	F	P	P	F
P	P	P	F	P	P	P	P	P	P
P	F	P	F	P	P	P	F	P	F
N/A	N/A	N/A	N/A	CP	CP	CP	CP	F	F
N/A	N/A	N/A	N/A	CP	CP	CP	CP	CP	CP
N/A	N/A	N/A	N/A	F	F	F	F	F	F
P	CP	CP	F	P	P	P	P	P	F

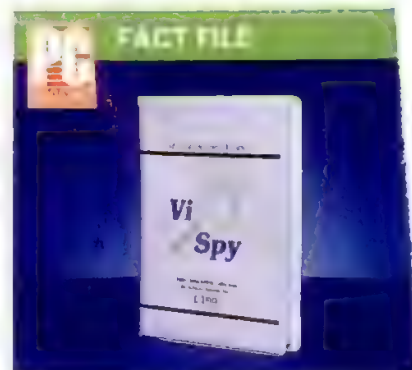
Haven't You Heard the News?



You don't have to buy the whole newsstand to get copies of your latest article or review. Order customized reprints from Ziff-Davis Publishing Co. and let potential clients read all about it.*

To find out how you can have your article or review reprinted, contact Claudia Crichlow—Reprints Manager; Ziff-Davis Publishing Company, One Park Ave., New York, NY 10016, 212-503-5447 or 212-503-5412. * Minimum quantity 500 reprints.

SOFTWARE ANTIVIRUS SOFTWARE



Vi-Spy, Version 6.0
RG Software Systems Inc., 6900 E. Camelback Rd., #630, Scottsdale, AZ 85251; 602-423-8000.
List Price: \$149.95.
Requires: 128K RAM, DOS 2.0 or later.
In Short: Vi-Spy is a command-line-driven program with good virus detection and prevention tools. To cure an infection it will wipe and erase files rather than try to repair them. You have to believe firmly in this approach to pay the relatively high price attached to this program. It is best deployed in corporate settings.

CIRCLE 418 ON READER SERVICE CARD

The company provides quarterly updates on floppy disks. The first year's updates are free, but after that, it will cost you \$149.95 per year. This means you're buying the program over and over again. There is a technical support line, and RG Software Systems will also analyze new viruses for you and send a detection routine as fast as possible, usually within 24 hours. Due out by the end of July, Version 7.0 of Vi-Spy will detect new viruses, display a virus description, and check memory between 640K and 1MB.

With a command-driven interface and a steep price for single users, Vi-Spy is best suited for corporate use. Even with the reduced cost for a site license, you have to be a strong adherent of Vi-Spy's approach to removing viruses to find the cost acceptable. ■

Carol Levin is a staff editor at PC Magazine. Emerson A. Torgan is an editorial assistant at PC Magazine. Winn L. Rosch is a contributing editor of PC Magazine. Carol Ellison, Henry Fersko-Weiss, John R. Quain, and Jim Quraishi are New York-based free-lance writers and are frequent contributors to PC Magazine. Greg Pastrick is a Massachusetts-based free-lance writer and a frequent contributor to PC Magazine.

THE PLUS IS DOS/MAC COMPATIBILITY.

Introducing the Kodak Ektaplug 7016 printer.

Equipped with Adobe PostScript language/Appletalk interface options, it can support both DOS and Macintosh computers simultaneously!

Configure it with four ports, and it can support up to four users, or even four networks.

Six emulations make it an ideal shared printer for any work group.

THE PLUS IS 16PPM SPEED.

Twice as fast as traditional printers, the Kodak Ektaplug 7016 printer can make you at least twice as productive. It maintains fast, high-quality throughput, even when printing Adobe PostScript language. It helps you get more done in a day.



THE PLUS IS A COPIER.

Imagine the convenience of having a built-in copier for those frequent one- or two-copy jobs! The Kodak Ektaplug 7016 printer comes standard with a 6 pages-per-minute convenience copier that keeps everybody on the job instead of on the run. For the name of the dealer nearest you, call 1 800 344-0006, Ext. 456.



THE PRINTER WITH A PLUS. KODAK

Kodak Ektaplug 7016 printer



How to create an awesome dBASE report in record time.



Because full font support is built right in, it takes no time to make custom reports look exactly the way you want.



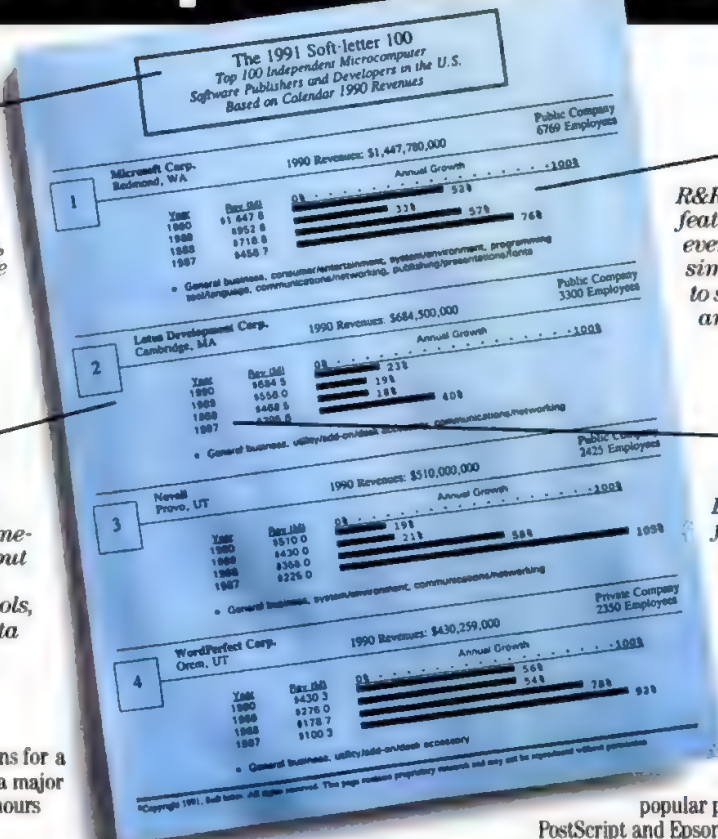
This report may look time-consuming, but it's not. With R&R's layout tools, positioning and aligning data is fast and fool-proof.



R&R's math features make everything from simple calculations to sophisticated numerical analyses quick and easy.



Even multi-file reports are a snap. Sort and select just the data you want, from any related database file, all in plain English.



If you develop dBASE® applications for a living, you're about to get back a major part of your life—those endless hours you spend programming reports.

Because with R&R Report Writer®, you can now create great-looking dBASE reports in a fraction of the time it takes to make plain-looking reports. All without programming.

Here's how.

R&R starts with a powerful screen painter that lets you quickly design custom reports that range from the simple to the sophisticated. With title pages, headers, footers, detail areas, subheads and report summaries.

Simply pick field names and drop them into place. Apply the built-in currency and date formats. Type text wherever you want it. Add printer attributes, including bold, underline and italics.

You can even use fonts anywhere in your report—soft, cartridges, built-in, scalable and PostScript®. The powerful WYSIWYG mode lets you preview your reports in multiple zoom levels.



And you can output to the screen, to a file, or to popular printers, including HP® LaserJet®, PostScript and Epson® dot-matrix.

Simplified reporting power well beyond dBASE itself.

R&R gives you all the reporting power of dBASE, and then some. Like true plain-English queries. Pre-processed totals for printing grand totals anywhere in a report, and for computing percent of totals. And much more.

Best of all, R&R makes it easy with intuitive Lotus®-style and pop-up menus, and instant on-line help. So you can be productive the first day you use R&R.

There's even a royalty-free multi-user runtime that prints your reports from within database applications.

PC World called R&R Report Writer "The undisputed reporting champ of the dBASE world." We think you'll call it a lifesaver.

Order now. We guarantee your satisfaction or your money back.

R&R Report Writer supports dBASE III®, III Plus®, IV®, Clipper®, Quicksilver®, dBase®, FoxBASE+®, and FoxPro®, all with built-in index support. And it costs just \$249.

Order now and join over 100,000 satisfied users who are already creating better-looking reports in far less time than the way you're doing it now. There's a 30 day money back guarantee,* so there's no risk. 1-800-325-9035.

R&R Report Writer®

The Professional Strength Report Writer

*Guarantee applies only to orders placed directly with Concentric Data Systems, or with participating dealers. © 1991 Concentric Data Systems, Inc. All product names are trademarks or registered trademarks of their respective owners.

Concentric Data Systems, Inc., 110 Turnpike Road, Westborough, MA 01581. Tel: 508-366-1122, Fax: 508-366-2954

CIRCLE 315 ON READER SERVICE CARD

It's been six years since the High Sierra standard gave CD-ROM the go-ahead it needed to become a major force on the PC. Only in recent months, however, have CD-ROM drives become fast enough to deliver on that potential.



Finally Up To Speed

by Mitt Jones

On the face of it, no other medium promises to meet the needs of both publishers and consumers in such a grand way as the CD-ROM disk. The publisher gets by far the least expensive way to distribute what can seem a miraculous amount of information—the equivalent of about 300,000 pages of printed material at a production cost of no more than \$10 per disk. The buyer gets not only 600MB or so of information on one relatively inexpensive, compact 4.72-inch platter, but also the ability to perform searches in a few minutes that could take months with printed material.

The problems with this rosy view during the lackluster five-year history of CD-ROM have been numerous. Not a great many publishers have been quick to find compelling uses for so much space; even fewer have been able or willing to market their titles (which often sell for \$600 to \$900) at an appealing price. And not many buyers have proved interested enough in the available titles to invest \$700 or so in a CD-ROM drive.

These problems remain to a certain extent, particularly with hardware prices, but vendors are making headway. Tandy is breaking new ground with its 1,000-millisecond Tandy CDR-1000 CD-ROM Drive, an internal drive priced at \$399.95. Sony's Laser Library bundles a faster, external drive—the 340-ms. Sony CDU-7205—with a collection of six CD-ROM titles for a list price of \$699.

Such prices are high compared with CD audio players, but for good reason. Many audio errors pass undetected by the human ear, but drives that handle data need far better error correction. Manufac-

turers must also equip CD-ROM drives with faster, more precise head-positioning mechanisms, in part because the nature of data retrieval calls much more often for random access, but also to overcome the intrinsically slow nature of the CD format (see the sidebar "How CD-ROM Drives Work").

As for software, a glance through the Bureau of Electronic Publishing's summer 1991 product guide, virtually a catalog of the entire CD-ROM industry, reveals a handful of titles for under \$100, including the complete works of Shakespeare for \$49 and a library of C language routines and utilities for \$88.

While the wait for the *Lotus 1-2-3* of the CD-ROM industry—the one title compelling enough to push disk drive sales through the roof—continues, hundreds of CD-ROM titles are making their way to the market. Titles now available include not only general reference works such as *Microsoft Bookshelf* and *Comp-*

ton's Multimedia Encyclopedia but also titles specific to fields such as medicine, science, business, agriculture, government, law, religion, education, and of course computer programming.

You will also find numerous disks offering slews of photographs, clip art, and fonts for desktop publishing applications (for a sample of the available titles, see the sidebar "From The Canterbury Tales to the Yellow Pages, CD-ROM Titles Are Ready to Deliver"). The great majority of these titles still sell for several hundred dollars, but the sheer volume of data on a single disk can often justify the expense of both hardware and software. A \$395 collection of bibliographic information on all U.S. patents is a prime example.

THE MULTIMEDIA PC

CD-ROM may finally gain wide appeal in the next few months as standards emerge for multimedia applications in education and entertainment.

The same qualities that make CD-ROM

HOW CD-ROM DISKS WORK

by Rock Miller

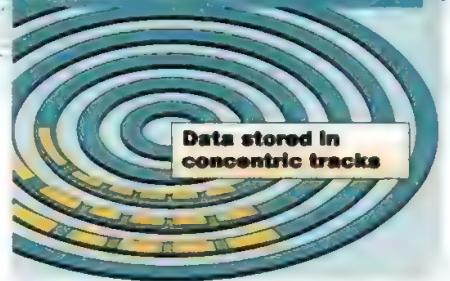
CD-ROMs can store an enormous amount of information, but getting to it rapidly is another story. Though their access times have improved over the last few years, even the best of today's CD-ROM drives are a great deal slower than hard disks. A few numbers make the comparison clear: The fastest drive in our review, the NEC Intersect CDR-73, has a rated average access time of 300 ms., compared with about 85 ms. for the early XT hard disks and about 28 ms. for the hard disks in most of today's PCs for hard disks.

There are a couple of reasons why CD-ROM drives are slower than ordi-

nary hard disks. First, a CD-ROM's sectors are arranged in a continuous spiral track (Figure 1). This spiral track is ideal for reading large blocks of sequential data, such as music. Using the spiral track allows CD-ROM makers to take advantage of the equipment and infrastructure developed for mastering, pressing, and playing audio CDs. But it makes for slower random access times than the concentric tracks used by hard disks (Figure 2), whose sectors can be located faster because they are always found on a given track at a fixed distance from the center.

The other reason lies in the way sectors are arranged along the tracks. Hard disks use a constant angular velocity (CAV) encoding scheme, in which the disk spins at a constant rate of speed and each sector occupies the area subtended by a fixed angle. Sectors are placed at maximum density along the inside track of the disk; going outward, however, the sectors must spread to cover the increasing track circumference, leading to "wasted" space between them and within them (Figure 2).

FIGURE 2: Hard Disk



To make use of this space, CD-ROM disks use the constant linear velocity (CLV) encoding scheme, in which the length of a sector is constant regardless of whether it's located on the inside or the outside of the disk (Figure 1). This means that the rotation speed of the disk must vary inversely with the radius; the motor must slow down the disk to read sectors toward the outside of the disk and speed it up to read sectors toward the inside of the disk. Doing this requires a more complicated drive mechanism that can overcome the inertia of the disk when accelerating and the momentum when decelerating, which slows the drive's random access times. But this encoding scheme also allows data to be packed at maximum density over the entire disk.

FIGURE 1: CD-ROM Disk



an excellent medium for publishing large amounts of text-based data—its relatively low cost and generous capacity—render it the only practical medium for applications that use any significant amount of digitized audio or video.

In order to guarantee a standard delivery platform for multimedia developers, Microsoft announced its Multimedia PC Specification last year. PCs, peripherals, and software that meet the specification will bear an MPC trademark, much like the VHS logo that adorns appropriate video tape players and software. The trademark will be administered by the Multimedia PC Marketing Council, an arm of the Software Publisher's Association formed to help guarantee that consumers can safely buy multimedia products without worrying about compatibility.

The "Level 1" MPC platform consists of a 10-MHz 286 processor or better, 2MB RAM, a 30MB hard disk, a 3.5-inch 1.44MB floppy disk drive, a VGA graphics adapter, numerous audio components, including a synthesizer and MIDI interface, and—you guessed it—an appropriately fast CD-ROM drive.

The system software of an MPC-adherent PC must also "conform to the APIs, function and performance described in the *Microsoft Windows Software Development Kit Programmer's Reference*." In other words, an MPC system must be able to run *Microsoft Windows* with Multimedia Extensions 1.0, which is scheduled for release along with the official MPC rollout in early October. (See Charles Petzold's *Environments* column in this issue for an in-depth explanation of how the Multimedia Extensions work.)

MULTIMEDIA WOES

CD-ROM takes its roots from the physical structure of the audio CD, which is detailed in the Philips specifications now known as the Red Book.

When Philips (co-owner of CD technology along with Sony) defined the specifications for CD-ROM (which came to be known as the Yellow Book), it used the same 2,352-sector length, spiral layout, and constant 75-sector-per-second linear velocity used for the audio CD.

The Yellow Book differs most notably from the Red Book in that it dedicates 304 bytes of each sector to uses other than data storage, primarily to accommodate the demanding error detection and correction that data-intensive applications require.

The Yellow Book gave hardware

Jonathan Matzkin and Rock Miller are associate editors of *PC Magazine*.

Gayle C. Ehrenman and Carol Levin are staff editors of *PC Magazine*.

Eric Berlin is an editorial assistant at *PC Magazine*.

Bruce Brown and Mitt Jones are contributing editors of *PC Magazine*.

Patricia Isaza is an associate art director of *PC Magazine*.

Kellyn Betts, Greg Pastrick, Wendy Dugas Pérez, Ed Perratore, and Don Trivette are frequent contributors to *PC Magazine*.

manufacturers a common formula for building CD-ROM drives but did not address the question of how software would be stored. That issue was resolved in 1985 when a group of vendors agreed on the High Sierra format, which established an open standard for the logical structure and file format of the compact disk. It and its tidied-up successor, ISO 9660, encompass more than the PC. ISO 9660 includes provisions for producing a single disk that will run on more than one platform: Many older titles and nearly all

recent ones run on both DOS and Macintosh machines.

Unfortunately, neither ISO 9660 nor the Yellow Book provide a technique for interleaving audio with text, graphics, or video. If a software developer wants to play a segment of *The Four Seasons* over a time-lapsed video of the life of an amoeba, for instance, she must read the Vivaldi, buffer it in system RAM, and channel it appropriately as the CD-ROM drive rolls the amoeba.

And CD-ROM's seemingly insatiable capacity begins to look like nothing when you have to deal with uncompressed video. With 640-by-480 resolution and 24-bit color definition, you can get about 240 frames of video on one disk. At an ideal rate of 30 frames per second, this translates into a whopping 8 seconds of full-motion video. You also must move each frame over the interface and PC bus at a rate of about 30 megabits per second, far beyond the capabilities of today's drives. Digital audio consumes less space and system resources, but even here compression of some sort is needed: Only 60 minutes of Red Book audio fit onto one disk.

So you will not see elegant, awe-inspiring titles loaded with digital audio and full-motion video for some time, until at least one of various competing technologies presents the right combination of



EDITORS' CHOICE

■ Sony CDU-7205

CD-ROM technology has clearly moved ahead since very slow drives with very high prices appeared several years ago. It should come as no surprise to see that Sony, a company that helped develop the CD format and did so much to make the audio CD popular, is working to make the CD-ROM format succeed on the PC.

The Sony CDU-7205 delivers the best value of the drives we tested. With a 340-ms. access time and a small 8K buffer, the CDU-7205 was not the fastest drive. But with easy installation (not something to be taken for granted with CD-ROM drives) and a low price, the CDU-7205 is the best choice for a personal CD-ROM drive.

Honorable mention goes to three

other drives, each for a different reason. The Texel DM-5021 represents an even better price for repackaged Sony technology. It scrimps on a few features, but it remains a good buy for the bargain hunter.

The NEC CDR-73 represents high performance at any cost. With a list price 40 percent higher than the Sony CDU-7205, it does not represent the most bang for the buck. It stands out as a good shared drive, however. (A review of CD-ROM network software will appear in *PC Magazine* later this year.)

Finally, the innovative design of the CD Porta-Drive Model T3201 represents a breakthrough in portability that does not sacrifice good value.

FROM THE CANTERBURY TALES TO THE YELLOW PAGES, CD-ROM TITLES ARE READY TO DELIVER

Once, CD-ROMs were a medium without a message. Today, the message is loud and clear: If it requires large amounts of information, it belongs on CD-ROM. The following capsule reviews include the most interesting and useful CD-ROM titles we could find, ranging from business tools to multimedia extravaganzas.

While the software interfaces and available features are generally inferior to what you've come to expect from software (storing or printing text is often difficult, sometimes impossible) the design of these CDs represents a considerable improvement over the bare-bones designs of the first CD-ROM titles.

The quality of CD design is due to get a major shot in the arm in coming months, as developers use the multimedia extensions that Microsoft is preparing for *Windows*. None of the titles we reviewed were able to take advantage of that potential, though several titles that do should be available in time for Christmas. Running under *Microsoft Windows*, CD-ROM titles should be able to make lavish use of graphics and sound.

There are plenty of other useful titles beyond the following. If you're looking for something specific, call the Bureau of Electronic Publishing (800-828-4766 or 201-808-2700), one of the largest distributors of CD-ROM products. If the title's still available, the Bureau should be able to help you find it.



ART AND LITERATURE

CD-ROM Shakespeare, CMC Research (Portland, Oregon), \$49.

If you're looking for a complete collection of the Bard's works, this disk is a bargain. The plays, well-formatted and easy to read, come in both American English and Queen's English (although you cannot easily toggle between the versions).

The disk has a detailed glossary, but searching the plays is not as easy as it could be. Finding act I scene I of *Othello* is as simple as hitting the Enter key a few times from a table of contents, but if you want to skip from scene I to scene II, you'll have to return to the topmost menu and start searching the contents again. And though you can print text or copy it to your hard disk, you must do this scene by scene. The company also offers the complete Sherlock Holmes on-disk.—Eric Berlin

Coate's Art Review: Impressionism Volume I, Quanta Press (St. Paul, Minnesota), \$129.

A survey of impressionist artwork and art-

ists, this disk includes 600 digital representations of canvases by Cézanne, Monet, Seurat, van Gogh, and others, plus a general chronology of the period, biographical information on the artists, and catalog details of the paintings. The CD-ROM format makes it easy to search for a particular work, but the information available is superficial. And though you can display the images full-screen on a VGA or Super VGA monitor, much is lost in the translation; in fact, some representations (such as van Gogh's *Starry Night*) are downright inaccurate in both color and texture. Until digital scanning and display standards improve, you would be wise to spend your money on an attractive art book or a trip to the museum.

—Patricia Isaza

Library of the Future Series, First Edition, World Library Inc. (Garden Grove, California), \$495.

If you have ever dreamed of effortlessly searching the great works of world literature for words, phrases, or ideas, you are in for a treat. This single-disk wonder contains the unabridged texts of 450 of the world's greatest literary, philosophical, and historical works, including the best of ancient Greek drama, the King James Bible, Darwin's *The Origin of Species*, Marx and Engels's *The Communist Manifesto*, Melville's *Moby Dick*, the complete works of Shakespeare, and much more. You can quickly perform Boolean word, phrase, or proximity searches, and you can narrow your search by author, time, place, or category. If you simply want to call up *The Canterbury Tales* and begin reading, you can do that too. You can send output to printer or disk, though only via a screen print command.

This disk is not for serious scholars. World Library based its selection of translations and editions primarily on pragmatic rather than literary concerns. The texts have no footnotes, and you cannot annotate them or save queries on your hard disk. But given the sheer volume of worthy texts at a reasonable price, laymen should have no problem forgiving these faults.—Mitt Jones

The Bible Library, Ellis Enterprises (Oklahoma City, Oklahoma), \$149.95.

This disk is a wise investment for both laymen and scholars of the Bible. It holds no fewer than 9 different versions of the Bible, plus 20 related reference works such as *Elwell's Evangelical Dictionary of Theology*, *Strong's Greek and Hebrew Dictionaries*, and *Vine's Expository Dictionary of Old and New Testament Words* (with Strong's numbers). The Apocrypha, however, is currently missing, even from the translations that originally included it.

You can conduct global word and phrase searches across books and versions. A unique split display allows you to compare multiple versions of the same text. After you complete a search, you can save your findings to a file or output them to a printer. The wealth and quality of *The Bible Library's* source material, combined with its well-designed search capabilities, makes it the disk to have for Biblical research.

—Don Trivette



ENCYCLOPEDIAS

Compton's Multimedia Encyclopedia, Britannica Software (San Francisco, California), \$795.

This full-fledged multimedia encyclopedia pushes CD-ROM technology to its limits. Its icon-driven interface, built around a Topic Tree (an outline of the entire encyclopedia), lets you quickly navigate among the encyclopedia's categories, which include science, history, and a world atlas.

You can see your research path, view the graphic accompanying an article, copy information to a notebook, look up a word, or print selected text. You can also listen to sound bites (famous sayings, for example) or see short bits of animation, such as a cutaway view of the moving joints of the hand or a few seconds of an earthquake.

The program uses a thin block-letter font that can be hard to read, and it requires so much RAM that you will be hard-pressed to find room for more than DOS and the obligatory mouse driver. Even so, it's one of the best examples yet of what the medium can do. It is an inspiration to the CD-ROM field as well as a useful tool for the student or researcher.—Ed Perratore

The New Grolier Electronic Encyclopedia, 1991 Version, Grolier Electronic Publishing Inc. (Danbury, Connecticut), \$395.

Though staid in comparison to its flashier cousin, *Compton's MultiMedia Encyclopedia* (above), this encyclopedia has its own advantages. It gives you the complete text of Grolier's *Academic American Encyclopedia*, plus a selection of pictures (historical figures, places, and objects) and sound bites (animals, musical instruments, and so on).

You can conduct up to four complex searches at once, using Boolean operators and wildcards, and change settings for where and how to search permanently or on the fly. When browsing an article, you can view a related graphic or hear a sound sample by pressing a key. You can easily summon up related articles by pressing Alt-L while high-

lighting most uppercase words. You can maintain as many as six windows at once and print or save selected text from your active window to a notepad or to an ASCII file.

Groler's interface is unexciting and its mouse support is limited, but this will not hinder students from accessing this valuable reference work.—**Ed Perratore**



GAZETTEERS

Software Toolworks World Atlas, Software Toolworks (Novato, California), \$79.95.

Every shelf should have an atlas, and this disk gives you all the basics in electronic form: simple scanned maps of world countries, supplemented by basic statistics, dynamic time-zone information (keyed to your system clock), and useful travel tips. The GEM-like graphical interface is a virtual model of simplicity and clarity. To move to a specific region or country, you simply point and click (or look up the name alphabetically).

The latest version lets you generate and print a range of statistical maps and graphs for selected countries. You can see topographical features for regions and even oceans. Simplicity can be taken a bit too far, though: The country maps show major cities and rivers but no internal boundaries or other details (don't look for Slovenia or Armenia here), and Germany is still divided into East and West.—**Rock Miller**

Countries of the World, Bureau Development Inc. (Parsippany, New Jersey), \$495.

Although this disk has a few scanned maps of extremely poor quality, photographs of various kinds, and even a bit of audio information (national anthems), its heart consists of text: Department of the Army papers on history, economics, religion, and other topics. It also includes basic statistics from the CIA World Fact Book and a few documents from various embassies, largely promotional in nature.

You can perform Boolean searches on words, authors, or subjects, and you can also browse through a list of words in the entire database, but you cannot do two-word or proximity searches. You can save only entire documents, not individual passages, on-disk.

The reports are chock-full of fascinating information and are consistently organized, but the heavy reliance on verbatim third-party documents gives them a generic feel. A more individual, creative touch would improve them.—**Rock Miller**

GEOdisc US Atlas, GEOvision Inc. (Norcross, Georgia), \$595.

GEOdisc US Atlas, which combines a CD-ROM map database with *Windows/On the World* retrieval software, takes a different tack from the usual PC-based atlas. Instead of reproducing scanned paper maps, it uses sophisticated GIS (geographic information system) technology to bring you the highly detailed, object-based Digital Line Graph (DLG) maps from the U.S. Geological Survey.

Several map databases are available, all of them suffocating in detail; they include not only national and local political boundaries but highways, railroads, watercourses, and airports. The *Windows*-based software, which installs on your hard disk, lets you select which regions and elements you want to see.

You can overlay your own data or annotations on the maps (and store them on the hard disk), and you can even locate features by latitude/longitude coordinates, determine distance and bearing, and calculate the areas of regions. Unfortunately, it's difficult to winnow this mass of information to a useful level, and the interface can only be described as weird. The idea is terrific, but the implementation needs work.—**Rock Miller**



HISTORICAL REFERENCE WORKS

U.S. History on CD-ROM, Bureau Development (Parsippany, New Jersey), \$395.

A well-executed example of how useful a CD-ROM can be, this single-topic disk is a model of not only prudently chosen data but contents presented intelligently for efficient information retrieval. *A Century of Photographs, 1846-1946*, which contains a wealth of historical images that can be displayed in near-photographic VGA resolution, is just one of 107 books anthologized on the disk. There are also numerous texts covering U.S. history in general, military history (*Air Force Heroes in Vietnam*, for example), and specific topics such as the Wright Brothers.

These disparate works are unified by basic search software that lets you conduct full-text searches for any string or browse a word list; tapping the Enter key produces a list of related articles. Unfortunately, the software has no similar option for browsing a master list of images.—**Jonathan Matzkin**

USA Wars: Civil War, Quanta Press (St. Paul, Minnesota), \$129.

If *U.S. History on CD-ROM* (above) is a wealth of well-presented data, then *USA*

Wars: Civil War is at best a wealth of data. Like the previous releases in Quanta's *USA Wars* series, the *Civil War* disk focuses on a specific event in U.S. history. It has a lot of useful information, including battles, campaigns, biographies, and statistics, plus samples of Civil War-era music, but a weak interface and sloppy production values make it less enjoyable to use than it could be.

While *U.S. History* offers clear menus and search criteria templates, *Civil War* relies on cryptic numeric prompts at which you enter commands. The documentation is sketchy and riddled with typographical errors. Though the disk is a valuable tool for committed students or academics, its rugged interface will scare off casual users.—**Jonathan Matzkin**



NEWS REVIEWS

Facts on File News Digest, Facts on File (New York, New York), \$795.

Who won the World Series in 1986? Who was Speaker of the House in 1988? You can find the answer to these questions and many more in *Facts on File News Digest*, which recounts a decade of national and international news, from sports, politics, business, and science to theater, best-sellers, film, and celebrities.

The 40,000 weekly abstracts, based on articles from leading news sources, are written by Facts on File researchers. The *Windows*-based software has a good interface, context-sensitive help, an on-line tutorial, and an easy installation program. The program can compile a list of matching articles from a word or phrase; searches can be restricted to specific years, months, and days.

The package's main flaw lies in its collection of 500 maps; although these include such specialized views as global petroleum reserves and U.S. foreign economic aid, they are poorly designed and often cause the system to crash. You can print articles, but you cannot display more than one article at a time or export the text to a word processor.—**Carol Levin**

Front Page News 1990, Wayzata Technology Inc. (Prior Lake, Minnesota), \$149.

Another source of news on CD is *Front Page News 1990*, which collects the full text of more than ten U.S. and international wire services and news sources covering November 1989 to December 1990. Quarterly updates are available for \$80, and the August update will add Reuters and Tass coverage.

CONTINUES

CD-ROM TITLES (CONTINUED)

The program has a *Windows*-like interface with pull-down menus and on-line help. You can find words in a headline simply by typing; you can also launch Boolean, wildcard, and proximity searches.

The program has no fuzzy search, so you are out of luck if you can't figure out how to spell "Tiananmen Square." And you cannot restrict your scrutiny to a single publication. But you can save an article or part of an article, print it, or export it to your word processor. You can even compile "infobases" and distribute them over a network, although this feature is obscure and not well documented. In any case, the disk is a convenient and compact alternative to the newswire, if less up to the minute.—Carol Levin

The 1990 Time Magazine Compact Almanac, Compact Publishing Inc. (Washington, D.C.), \$195.

One way to deal with those old stacks of *Time* magazines is to replace them with a thin compact disk. The current CD version of *Time* features the magazine's full text for 1989, including cover portraits and color charts, plus selected articles dating back to the first issue in 1923.

An accompanying almanac contains lists, tables, documents, maps, and directories, plus a current-events quiz. You can browse the articles, index, or conduct a word search. Still in planning at press time was a multimedia version that will supplement the articles with quarter-screen video segments.—Wendy Dugas Pérez



SCIENCE REFERENCES

Mammals: A Multimedia Encyclopedia, National Geographic Society (Washington, D.C.), \$149.95.

You know what a leopard looks like, but you have ever watched one stalk an antelope? *Mammals: A Multimedia Encyclopedia* lets you see, hear, and learn about over 200 mammals through full-motion video clips, still photos, sound bites, and text. Designed for school-age students, *Mammals* combines essays taken from National Geographic's *Book of Mammals* with fact boxes, vital statistics, range maps, and captioned photographs. It also includes a pop-up glossary of terms and definitions.

Navigating these wilds is as easy as pointing and clicking on alphabetical listings, icons for the major features (including a tutorial and classification game), and hypertext links that lead to cross-referenced information and spoken pronunciations.

As a teaching tool, entertainment, and inspiration, *Mammals* is king of the CD-ROM jungle. It provides the type of interactive learning experience you just can't get from a book.

—Gayle C. Ehrenman

CONTINUES

At least one vendor sacrifices speed for competitive pricing.

storage savings, performance, and economy of price to make them possible.

CD-ROM XA, endorsed by both Philips and Sony, which builds on the Yellow Book and ISO 9660 to allow interleaving of audio, would seem to be the top contender, but this specification does not yet address video compression.

For that, we will have to wait for Intel's digital video interactive (DVI) CD-based specification to become affordable. Given that Microsoft endorses CD-ROM XA and refers to it as a Level 2 standard, it's a safe bet that any future plans for XA will fit in with MPC and multimedia *Windows* (and that DVI may become Level 3). For the immediate future, though, the Level 1 MPC standard is as close as mainstream software developers will get to delivering live-action video.

THE HERE AND NOW

Given its promise for education, entertainment, and myriad other uses, one has to start somewhere with multimedia. Widespread support of the MPC specification and *Multimedia Windows* would seem to make MPC a better place than any other to start: Founding members of the Multimedia PC Marketing Council include AT&T Computer Systems, CompuAdd Corp., Creative Labs, Fujitsu America, Media Vision, NEC Technologies, Olivetti Office USA, Philips Consumer Electronics Co., Tandy Corp., Video Seven/Headland Technology, and Zenith Data Systems. All have announced MPC PCs or MPC upgrade kits, or are expected to announce them along with the October MPC rollout.

BUYING CONSIDERATIONS

Whether or not you believe that the MPC specification is destined for greatness, you cannot go wrong if you choose a drive fast enough and designed well enough to run smoothly with multimedia applica-

tions. Motion video presents the CD-ROM drive with its greatest challenge: To keep video action smooth, the drive must not only achieve an acceptably high average throughput but must also maintain an even flow of information going into its buffer.

Microsoft's MPC specification calls for an average sustained transfer rate of 150 kilobits per second with a CPU utilization of no more than 40 percent.

Each drive included in this roundup purports to sustain this 150-Kbps rate, though not all proved capable of doing so during PC Magazine Labs' tests. Several drives, including Philips' novel Magnavox CCD461 (essentially a full-featured audio CD player also capable of CD-ROM operation) were not reviewed because they did not meet this selection criterion.

Of the drives reviewed, some—most notably the NEC Intersect CDR-73—performed extremely well on throughput tests but failed to play video clips smoothly. Other drives, such as the Sony CDU-7205, performed well on all tests despite a small buffer. And at least one manufacturer is sacrificing random access speed for competitive pricing: Tandy rates its CDR-1000 at 1000 ms., and the random throughput suffers accordingly. While it is true that random access speed will have little or nothing to do with the ability to display smooth video from a well-designed title, be aware of the trade-off before you make it: A 1,000-ms. CD-ROM drive may handle video with aplomb, but it requires substantial waits while it finds the right clip.

Other factors to consider include whether the drive requires a caddy, and if so, what type. The Sony caddy—the de facto standard—is convenient enough to open and helps protect the disk from dust and fingerprints. It is also inexpensive enough to encourage users to buy one for each of their CD-ROM titles.

All of the drive/adaptor combinations we reviewed and any others you may consider should provide two pieces of software at no additional cost: a driver to configure the adaptor to the system and a recent version of Microsoft CD-ROM Extensions, the DOS drivers that allow users to access CD-ROM drives as they would a hard or floppy disk. Many drives also now come with a utility that allows the drive to play CD audio disks through the headphone jack or RCA jacks.

Take a good look at prices as you make your decision. A drive listed for \$895 may

Why Is Northgate Going Public With Confidential Information?

CIRCLE 194 ON READER SERVICE CARD

To Illustrate The Northgate



Take a behind-the-scenes look at Northgate quality.

It's no secret that Northgate makes some of today's finest computer systems. A room full of awards from major industry publications is proof of that. But the tour you're about to take will show you how Northgate achieved its worldwide reputation for quality.

The reason we're "going public" with this information is simple. People who already own a Northgate system know from experience that we make no compromises on quality. Now we want the rest of the world to know about the qualities that made Northgate a leading direct marketer of high-quality systems.

Complete line of systems.

- **Latest technology.** The Northgate systems you buy today won't become obsolete tomorrow.

- **Complete product line.** From lightweight notebooks to giant network file servers, Northgate makes a complete range of computers to handle every business application. Our newest products include low-priced 386SX™, 386 and 486™ systems.
- **Award-winning performance.** Our most recent triumphs include *InfoWorld* and *BYTE* magazines' "Desktop Computer of the Year" awards. Seven *PC Magazine* Editors' Choice awards, eight *Computer Shopper* Best Buy and three other *InfoWorld* recognitions are added proof of Northgate quality.
- **Customized, ready-to-run systems.** Northgate custom configures every system to meet your specific requirements. We'll even rack mount or hard case your systems.
- **Finest components.** We test and use components from only the best manufacturers to ensure peak performance and reliability.

- **Flawless software compatibility.** Our systems are fully compatible with MS-DOS®, OS/2®, Novell® and other operating systems.
- **Product testing and burn-in** ensures your system will work perfectly from day one.
- **All systems are FCC Class B Certified** for home and office use.

Network solutions.

- **Northgate LAN specialists** are uniquely qualified to configure and install high quality products that provide a solid foundation for networking.
- **Novell Certified Gold Dealer.** We certify and test all products to work perfectly with Novell as well as OS/2, SCO/UNIX® and Banyan® Vines. And our staff of Certified NetWare® Engineers will help keep your LAN operating at peak efficiency.



Commitment To Quality.



Customer service and support ensures your complete satisfaction.

- 24-hour toll-free technical support 365 days a year, for as long as you own your system.
- Free year of on-site service provided by NCR®. Your complete satisfaction is our commitment. If necessary, we'll even send a skilled technician to your home or office.
- Free overnight shipment of replacement parts to minimize computer downtime.
- 30-day money-back guarantee safeguards your purchase decision.
- Full parts and labor warranties — 1 year on systems, 5 years on keyboards.
- Customized service and support plans for corporate customers. Whatever you need in the way of service, Northgate delivers. We offer a variety of customized service options including disaster recovery planning.

Affordable quality is yours with Northgate.

- Low Factory-Direct Prices.
- GSA/Government and VAR discounts.
- Leasing plans with low monthly installments and flexible terms up to five years.
- 100% financing with Northgate's Big 'N' Card. We can usually set up your account the same day you call.
- Other convenient payment options include MasterCard, VISA, American Express and Discover cards, wire transfers, personal and corporate checks, Corporate Purchase Orders and C.O.D.

Our promise: no compromises.

As you're about to see, our reputation for quality is built on a solid foundation of superior design, engineering, manufacturing, and service.

Turn the page to begin your tour of Northgate.

CALL TOLL-FREE 800-828-6125



"Smart Tools For Business"™

7075 Flying Cloud Drive, Eden Prairie, MN 55344

See Us At
Fall Comdex
Booth #52286
At The Sands

Quality Through Engineering

Manufacturing high-performance, quality systems takes more than just a top-notch Research and Development team. It requires a strategic alliance with the industry's premier component vendors. To meet our rigid standards, Northgate engineers work in tandem with our suppliers to design a full range of components. Then, they test hundreds of configurations to find the optimum combination of performance and reliability.

Throughout the entire vendor relationship, Northgate uses sophisticated failure analysis techniques (including microphotography) and statistical process control methods to ensure our suppliers consistently produce high quality componentry.



New Northgate 386 and 486™ Systems



Northgate 386SX™/16 or 20

- Intel® 80386SX/16 or 20 MHz Processor
- 1MB RAM (Expands to 16MB)
- 52MB IDE Hard Drive with 17 ms seek Time
- Five-Bay Case: Three 5.25" and Two 3.5" Bays
- Six 16-Bit Expansion Card Slots
- Choice of 1 2MB 5.25" or 1 44MB 3.5" Floppy Drive
- Exclusive *OmnitKey*® Keyboard
- SVGA 800 x 600 Color Monitor
- MS-DOS 3.3 4.01 or 5
- FCC Class B Certified

\$1599⁰⁰/\$1699⁰⁰



Northgate 386DX™/25 or 33

- Intel 80386/25 or 33 MHz Processor
- 2MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms seek Time
- 64K Cache
- Choice of 1 2MB 5.25" or 1 44MB 3.5" Floppy Drive
- Six 16-Bit and Two 8-Bit Expansion Card Slots
- Five-Bay Case: Three 5.25" and Two 3.5" Bays
- Exclusive *OmnitKey* keyboard
- SVGA 800 x 600 Color Monitor
- Microsoft® Windows™ 3.0 and Mouse
- MS-DOS 3.3 4.01 or 5
- FCC Class B Certified

\$2099⁰⁰/\$2199⁰⁰



Northgate 486SX™/20 or 486DX™/33

- Intel 80486SX/20 or 486DX 33 MHz Processor
- 4MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms seek Time
- 64K Cache
- Choice of 1 2MB 5.25" or 1 44MB 3.5" Floppy Drive
- Six 16-Bit and Two 8-Bit Expansion Card Slots
- Five-Bay Case: Three 5.25" and Two 3.5" Bays
- Exclusive *OmnitKey* Keyboard
- SVGA 800 x 600 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3 4.01 or 5
- FCC Class B Certified

\$2699⁰⁰/\$2899⁰⁰

Quality Through Compatibility

Once our components meet our highest expectations, a different set of engineers takes the helm. System configurations are set up on our own LAN test bed and undergo a grueling month-long battery of tests. We check hundreds of business software packages to ensure our systems run applications under MS-DOS, OS/2, Novell, SCO/UNIX, Banyan and other operating systems

Through this process, Northgate has earned an industry-wide reputation for flawless compatibility. Be assured that when you purchase Northgate systems, you're getting compatibility you can rely on

CALL TOLL-FREE 800-828-6125



See Us At
Fall Comdex
Booth #S2286
At The Sands

Northgate SlimLine™ Scalable Processing (SP) Systems



Northgate SlimLine SP™ 386/25 or 33

- Intel 80386/25 or 33 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache
- Continuous Edge Graphics Chip
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- SVGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$2999*/\$3099**



Northgate SlimLine SP 486SX/20

- Intel 80486SX/20 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache
- Continuous Edge Graphics Chip
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- SVGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3399**



Northgate SlimLine SP 486DX/33

- Intel 80486DX/33 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 52MB IDE Hard Drive with 17 ms Seek Time
- 64K Cache
- Continuous Edge Graphics Chip
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- SVGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3599**

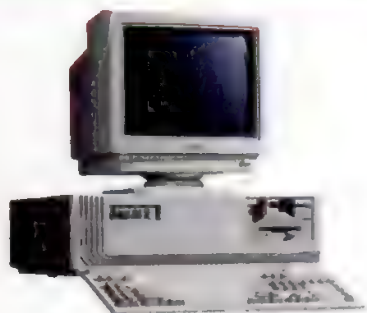
Quality Through Manufacturing

Northgate has studied manufacturing methods and has selected a process that gives the greatest quality and productivity.

Our technicians are skilled in all phases of manufacturing. Working in teams of four, they bring the elements of quality together with craftsmanship that knows no equal. A detailed system of checks and balances ensures strict adherence to our rigid quality control standards. When all is complete, comprehensive burn-in and final testing begin.



Northgate Elegance™ Scalable Processing (SP) Systems



Northgate Elegance SP™ 386/25 or 33

- Intel 80386/25 or 33 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 106MB IDE Hard Drive with 19 ms Seek Time
- 64K Cache
- Desktop Case
- 1 2MB 5.25" and 1 44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- SVGA 1024x768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3299⁰⁰/\$3399⁰⁰



Northgate Elegance SP 486SX/20

- Intel 80486SX/20 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM (Expands to 32MB)
- 106MB IDE Hard Drive with 19 ms Seek Time
- 64K Cache
- Desktop Case
- 1 2MB 5.25" and 1 44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- SVGA 1024x768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3699⁰⁰



Northgate Elegance SP 486DX/33

- Intel 80486DX/33 MHz Processor on Power Module
- Fast, Affordable Upgrades — Simply Replace Power Module
- 4MB RAM (Expands to 64MB)
- 106MB IDE Hard Drive with 19 ms Seek Time
- 64K Cache
- Vertical Power Case
- 1 2MB 5.25" and 1 44MB 3.5" Floppy Drives
- Exclusive *OmniKey* Keyboard
- SVGA 1024x768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$3999⁰⁰

Quality Through Service

Northgate backs every system with an award-winning package of service and support. Including a 30-Day Money-Back Guarantee, full parts and labor warranties (one year on systems, five years on keyboards) and free overnight shipment of replacement parts.

You also get toll-free technical support 24 hours a day, seven days a week. We track every detail concerning your system, including configuration, **NCR** previous questions and correspondence. This gives our staff immediate access to your system's history the moment you call. Should you require on-site help, we'll dispatch a trained NCR technician to your door. This service is free for one year.

CALL TOLL-FREE 800-828-6125



See Us At
Fall Comdex
Booth #52286
At The Sands

Northgate "Specialty" Systems



Northgate Elegance 486/25 or 33 EISA

- Intel 80486 25 or 33 MHz Processor
- 4MB RAM (Expands to 32MB)
- 200MB IDE Hard Drive with 15 ms Seek Time
- 128K Cache
- EISA Bus
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Vertical Power Case
- Exclusive *OmniKey* Keyboard
- SVGA 1024 x 768 Color Monitor
- Microsoft Windows 3.0 and Mouse
- MS-DOS 3.3, 4.01 or 5
- FCC Class B Certified

\$4599⁰⁰/\$5599⁰⁰



Northgate SlimLite™ 386SX/20

- Intel 80386SX/20 MHz Processor
- 1MB RAM (Expands to 5MB)
- 40MB Hard Drive
- 1.44MB 3.5" Floppy Drive
- 84-Key Keyboard Emulating 101
- 8.5" LCD Screen Supports 32 Shades of Gray, VGA 640 x 480
- 11.7" x 8.25" x 1.9", 6.1 Lbs.
- AC Adapter
- Stack™ Software (Provides up to 80MB of Storage)
- Magic Cursor™ for Windows or No-Squint II™ for DOS
- MS-DOS 4.01 or 5
- FCC Class B Certified

\$2799⁰⁰



Northgate OmniSystem™

- Dedicated SuperServer with Intel 80486 25 Processor
- 8MB RAM (Expands to 128MB)
- Dual-Channel SCSI Disk Subsystem with On-Board 80386 Processor (Expands to 6GB with Five 1.2GB Drives)
- EISA I/O Bus
- High-Speed 100MB Sec Memory Bus
- 1.2MB 5.25" and 1.44MB 3.5" Floppy Drives
- Vertical 10-Bay Power Case
- Exclusive *OmniKey* Keyboard
- VGA Monochrome Monitor
- FCC Class B Certified

Call for Pricing

Quality Custom Configurations



Northgate custom configures every system to meet your most demanding needs. We offer a comprehensive range of top quality components, giving us the capability of tailoring a system over 3,000,000 ways. To find out which is best for you, call one of our Systems Consultants toll free.

Hard Drives

Options include IDE hard drives with capacities of 52MB, 100MB, 200MB or 340MB. Also available are ESDI and SCSI hard drives with capacities as high as 1.2GB. Call for other drive size options.

Memory Expansion

Northgate systems have a variety of memory expansion capabilities. Our Systems Consultants can help you decide how much memory you need for both current and future applications.

Monitors

Northgate offers 12" VGA monochrome, 14" monochrome (amber), 14" VGA monochrome, 14" VGA color, 16" VGA color and 19" VGA color monitors. Resolutions include 640 x 480, 800 x 600, 1024 x 768, and 1280 x 1024. NEC 15", 17" and 19" flat-screen, low-radiation monitors also available.

Math Coprocessors

Speed up processor-intensive business applications with an Intel or Weitek® math coprocessor. A Northgate Systems Consultant can help you select the right one for your system.

Tape Backups

To protect your valuable data, Northgate offers an array of high-speed tape backup devices. Choose internal or external designs in the following capacities: 40/120MB, 80/304MB, 80MB, 150MB, 300MB and 1.3GB.

Communications

Northgate has the right equipment to link your system to other computers or fax machines. Products include internal and external MNP-5 modems in 2400 and 9600 baud speeds. Also available is Northgate FaxIt for Windows, a revolutionary fax card designed to work from within your Microsoft Windows applications.

Printers

The best thing to have beside your computer is a printer from Northgate. Printer options include low-cost 9-pin and 24-pin dot matrix printers as well as laser printers and PostScript-compatible laser printers for the very best print quality.

Floppy Drives

Floppy drive options include 5.25" models in 360K and 1.2MB designs and 3.5" models with capacities of 720K and 1.44MB.

CD-ROM & Other Hardware

We can also configure your Northgate system with many other hardware options, including CD-ROM drives, high end video cards, and I/O cards. Call and ask a Northgate Systems Consultant for the latest options and prices.



**CALL TOLL-FREE
24 HOURS EVERY DAY 800-828-6125**

Major corporations, volume purchasers and government agencies call National Business Accounts: **800-545-6065**

Fax your order! 800-323-7182

Notice to the Hearing Impaired: Northgate has TDD capability. Dial 800-535-0602.

See Us At Fall Comdex, Booth #52286 At The Sands



"Smart Tools For Business"™
7075 Flying Cloud Drive, Eden Prairie, Minnesota 55344

Northgate OmniKey Keyboards — Quality Designs No System Should Be Without!



OmniKey/101NI

- 12 F-Keys On Top
- Alps Click/Tactile Key Switches
- Independent Inverted T Cursor Control And Numeric Keypads
- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM® Compatibility
- FCC Class B Certified

\$89**



OmniKey/102

- 12 F-Keys On Left
- Alps Click/Tactile Key Switches
- Independent Inverted T Cursor Control And Numeric Keypads
- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM Compatibility
- FCC Class B Certified

\$89**



OmniKey/ULTRA

- 12 F-Keys On Left And Top
- Alps Click/Tactile Key Switches
- Independent Inverted T Cursor Control And Numeric Keypads
- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM Compatibility
- FCC Class B Certified

\$129**

© Copyright Northgate Computer Systems, Inc. 1991. All rights reserved. Northgate, OmniKey, Elegance, SlimLine, SlimLine and the Northgate 'N' logo are trademarks or registered trademarks of Northgate Computer Systems. 80386SX, 80486SX, 80486 and the Intel Inside logo are trademarks of Intel. IBM is a registered trademark of International Business Machines Corp. MS-DOS, Microsoft Windows and OS/2 are trademarks or registered trademarks of Microsoft Corporation. All other products and brand names are trademarks and registered trademarks of their respective companies. Prices and specifications subject to change without notice. Northgate reserves the right to substitute components of equal or greater quality or performance. All items subject to availability. We support the ethical use of software. To report software copyright violations, call the Software Publishers Association's Anti-Piracy Hotline at 1-800-388-FIRM.

CODE: A1418

Decision-Making Is Easy With Our Free Kit.

If the decision concerning the purchase of computer systems falls on your shoulders, our *Decision-Maker's Kit* is one resource you'll want to have. It's loaded with information that will help you make the right computing decisions. There's no obligation. Just the facts that will make your decision-making easier.

Return This Postage-Paid
Card Or Call Toll-Free
For Latest Pricing
And Your Free
Decision-Maker's Kit

800-828-6125

Why Northgate® Is The One To Choose

1. Complete Product Line — from lightweight notebooks to giant network file servers.
2. Latest Technology — your systems won't become obsolete tomorrow.
3. Award-Winning Performance — a room full of trophies and awards is proof of Northgate's cutting-edge performance.
4. Customized Systems — we don't pre-build stock systems; we "tailor make" each system to meet your specific needs.
5. LAN/Networks Expertise — our extensive experience equips us to configure and install smooth-running networks.
6. Flawless Compatibility — with MS-DOS®, Novell®, OS/2® and others.
7. Product Testing And Burn-in — ensuring that our systems will run perfectly from the day you unpack them.
8. 24-Hour Toll-Free Technical Support — 365 days a year.
9. Free Year Of On-Site Service — provided by NCR® — if we can't meet your needs over the phone.
10. Free Overnight Shipment Of Replacement Parts.
11. Customized Service And Support — we offer everything from custom rack mounting and hard casing of systems to disaster recovery planning.
12. Low Factory-Direct Prices.
13. Full Parts And Labor Warranties — 1 year on systems; 5 years on keyboards.
14. 30-Day Money-Back Guarantee.
15. 100% Financing Available — our Big 'N' Card can free up your other credit cards.
16. Leasing Plans.
17. Convenient Payment Options — most major credit cards, wire transfers, checks, Corporate Purchase Orders, C.O.D.
18. Government/GSA Discounts.
19. VAR Discounts.
20. Corporate Volume Purchase Discounts.



"Smart Tools For Business™"

© Copyright Northgate Computer Systems, Inc. 1991. All rights reserved.

Yes, Send Me Your Free *Decision-Maker's Kit!*

Return this postage-paid card for your free *Decision-Maker's Kit*. In a hurry? Call us and we'll mail your kit today.

Name _____
(Please print)
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Business phone (_____) _____
Home phone (_____) _____
Fax # (_____) _____

1. Are you interested primarily in computers for:
☐ Business ☐ Resale ☐ Home
2. If you indicated "business," what is your role in the purchase of computer systems?
☐ Decision-maker ☐ Decision-influencer ☐ None
3. Type of business? _____
4. What computer products have you been considering?
☐ 386SX-based systems ☐ 386-based systems
☐ 486-based systems ☐ Notebooks
☐ Dedicated network servers
5. How many computer systems do you already have at your company? _____
6. When will you most likely make your next computer purchase decision?
☐ Less than 3 months ☐ 3-6 months
☐ Within 12 months ☐ Don't know
7. What applications will you be running? ☐ Word processing
☐ Desktop publishing ☐ Accounting ☐ Database
☐ Spreadsheet ☐ Networking ☐ Other _____
8. Are you thinking about leasing systems? ☐ Yes ☐ No
9. ☐ Check this box if you would like to have a Northgate Systems Consultant call you.

CODE A1318

Yes, Send Me Your Free *Decision-Maker's Kit!*

Return this postage-paid card for your free *Decision-Maker's Kit*. In a hurry? Call us and we'll mail your kit today.

Name _____
(Please print)
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Business phone (_____) _____
Home phone (_____) _____
Fax # (_____) _____

1. Are you interested primarily in computers for:
☐ Business ☐ Resale ☐ Home
2. If you indicated "business," what is your role in the purchase of computer systems?
☐ Decision-maker ☐ Decision-influencer ☐ None
3. Type of business? _____
4. What computer products have you been considering?
☐ 386SX-based systems ☐ 386-based systems
☐ 486-based systems ☐ Notebooks
☐ Dedicated network servers
5. How many computer systems do you already have at your company? _____
6. When will you most likely make your next computer purchase decision?
☐ Less than 3 months ☐ 3-6 months
☐ Within 12 months ☐ Don't know
7. What applications will you be running? ☐ Word processing
☐ Desktop publishing ☐ Accounting ☐ Database
☐ Spreadsheet ☐ Networking ☐ Other _____
8. Are you thinking about leasing systems? ☐ Yes ☐ No
9. ☐ Check this box if you would like to have a Northgate Systems Consultant call you.

CODE A1318

Decision-Making Is Easy With Our Free Kit.

Return This
Postage-Paid Card
Or Call Toll-Free
For Latest Pricing
And Your Free
Decision-Maker's Kit

If the decision concerning the purchase of computer systems falls on your shoulders, our *Decision-Maker's Kit* is one resource you'll want to have. It's loaded with information that will help you make the right computing decisions. There's no obligation. Just the facts that will make your decision-making easier.

Why Northgate® Is The One To Choose

1. Complete Product Line — from lightweight notebooks to giant network file servers.
2. Latest Technology — your systems won't become obsolete tomorrow.
3. Award-Winning Performance — a room full of trophies and awards is proof of Northgate's cutting-edge performance.
4. Customized Systems — we don't pre-build stock systems; we "tailor make" each system to meet your specific needs.
5. LAN/Networks Expertise — our extensive experience equips us to configure and install smooth-running networks.
6. Flawless Compatibility — with MS-DOS, Novell, OS/2 and others.
7. Product Testing And Burn-in — ensuring that our systems will run perfectly from the day you unpack them.
8. 24-Hour Toll-Free Technical Support — 365 days a year.
9. Free Year Of On-Site Service — provided by NCR — if we can't meet your needs over the phone.
10. Free Overnight Shipment Of Replacement Parts.
11. Customized Service And Support — we offer everything from custom rack mounting and hard casing of systems to disaster recovery planning.
12. Low Factory-Direct Prices.
13. Full Parts And Labor Warranties — 1 year on systems; 5 years on keyboards.
14. 30-Day Money-Back Guarantee.
15. 100% Financing Available — our Big 'N' Card can free up your other credit cards.
16. Leasing Plans.
17. Convenient Payment Options — most major credit cards, wire transfers, checks, Corporate Purchase Orders, C.O.D.
18. Government/GSA Discounts.
19. VAR Discounts.
20. Corporate Volume Purchase Discounts.

 **NORTHGATE
COMPUTER
SYSTEMS, INC.**
"Smart Tools For Business"™

© Copyright Northgate Computer Systems, Inc. 1991. All rights reserved.

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 23357 MINNEAPOLIS, MN

POSTAGE WILL BE PAID BY ADDRESSEE

Northgate Computer Systems, Inc.

Attn: Dept. DM

P.O. Box 59175

Minneapolis, Minnesota 55459-9894

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 23357 MINNEAPOLIS, MN

POSTAGE WILL BE PAID BY ADDRESSEE

Northgate Computer Systems, Inc.

Attn: Dept. DM

P.O. Box 59175

Minneapolis, Minnesota 55459-9894

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

or may not come with the required adapter, which can easily add another \$150 to the actual price. Several manufacturers now take this pricing approach, not to deceive buyers but to offer a choice of XT/AT, PS/2, or Macintosh interface kits.

CONCLUSION

Now may truly be a good time to give CD-ROM a closer look, even if you number yourself among its skeptics. For the time being, the industry seems to have settled on a multimedia platform; even those who have little interest in multimedia will find enough compelling traditional CD-ROM titles to make the purchase worthwhile. Coupled with the advent of jukebox drives (scheduled for review in *PC Magazine* later this year), CD-ROM now seems an especially appealing option for shared access over a network. Most importantly, take a look at the software titles described on the following pages. You will probably be surprised by what you read and be tempted to buy.

CD TECHNOLOGY INC.

CD Porta-Drive Model T3201

by Mitt Jones

Even if you never intend to tuck your CD-ROM drive into a shoulder bag, the CD Porta-Drive Model T3201 should land near the top of your list of CD-ROM contenders. This 350-ms. external drive, which lists at \$795 plus \$120 for a Trantor T128 XT/AT SCSI adapter, takes up mercifully little desk space, matches the performance of its best competitors and can run for as long as 2 hours off its optional, \$300 nickel cadmium battery pack. Judging by its 50,000-hour projected mean time between failures (MTBF), the drive should also rate among the more dependable in this crowd.

The Toshiba-based CD Porta-Drive weighs 2.8 pounds and measures a trim 1.7 by 5.9 by 8.2 inches (HWD). The AC adapter and cable add a bit more weight but not so much that you have to tote a tremendous load to and from the office.

The secret behind CD Technology's promising MTBF rating lies largely with the external power supply. According to a CD Technology spokesperson, dust and other external particles account for 90 percent of CD-ROM drive failures. Since



CD Porta-Drive Model T3201

CD Technology Inc., 766 San Aleso Ave., Sunnyvale, CA 94086; 408-752-8500.

List Price: \$795; with XT/AT SCSI adapter and cable, \$915; with parallel-to-SCSI adapter and cable, \$1,015; with IBM PS/2 SCSI adapter and cable, \$1,115. Battery pack, \$300; additional AC power supply/charger, \$100; carrying bag, \$60; five-pack of CD-ROM caddies, \$50; CD audio-play utility, \$60; software device driver upgrade, \$50.

Requires: IBM-XT, AT, or compatible; DOS 3.0 or later.

In Short: This external Toshiba-based drive combines field-leading performance with true portability, making it an especially attractive choice for those who can spare little desk space or who need the freedom of a battery.

CIRCLE 614 ON READER SERVICE CARD

the fans that accompany power supplies tend to attract dust, removing the power supply from the drive cabinet will reduce any accumulation. The drive, which can operate either horizontally or vertically, also works to keep dust out of the cabinet by requiring a caddy (of the ubiquitous Sony variety) and by providing a door that seals the disk compartment.

POLISHED PERFORMER

The CD Porta-Drive performed admirably during all phases of PC Magazine Labs' testing, thanks in part to its 64K look-ahead buffer. In tests of both average random access and sequential-read throughput, the drive consistently tied with the Toshiba TXM-3301-E1 for second place after the NEC Intersect CDR-73—an unsurprising result, given that they are both Toshiba drives using SCSI adapters. Better still, the CD Porta-Drive handled the informal full-motion video portion of our testing with only one barely noticeable pause in the action, a feat that puts it ahead of all but a few of its competitors.

The two significant drawbacks of this drive, which comes with line-out jacks, a headphone jack, and a front-panel volume control, are the lack of a power indicator and a CD audio utility. A CD Technology spokesperson reports that the company is

CD-ROM TITLES (CONTINUED)

Multi-Media Audubon's Mammals and Multi-Media Audubon's Birds of America, CMC Research (Portland, Oregon), \$79 (*Mammals*); \$99 (*Birds*).

These two multimedia disks lack the glitz of National Geographic's *Mammals: A Multimedia Encyclopedia* (see the review on the previous page), but they compensate with the richness and interest of their content. The two disks include the complete text of Audubon's 1840 Octavio editions of *Quadrupeds of North America* and *Birds of America*, respectively, plus well-rendered reproductions of his renowned full-color lithographs.

In addition to detailed stories of habits and habitats, the disks offer a variety of animal sounds (including three different cougar sounds), and bird calls ranging from the American bittern to the yellow-shank tatter. The language used is sometimes archaic, and the information far from unbiased. The stories, tales from Audubon's adventures, are always interesting, though. Some of the tales even include recipes. Searching the database involves more than pointing and clicking, but it's far from difficult.

You can browse by words, subjects, or titles, search through the table of contents, or conduct word and phrase searches using wildcards and Boolean operators. You can even search just the images or sounds, and if you call up an image with an associated sound bite, the sound plays automatically.

There may be more current, more glamorous sources of information on birds and mammals, but it's hard to beat the charm and personality of these Audubon offerings, especially when they're presented in such a convenient form.

—Gayle C. Ehrenman

McGraw-Hill CD-ROM Science and Technical Reference Set, McGraw-Hill Electronic Publishing (New York, New York), \$265.

If you're a scientist (even a budding one), you will find all aspects of science and technology from astronomy to zoology in this comprehensive set of articles and dictionary entries, taken from the *McGraw-Hill Concise Encyclopedia* and the *McGraw-Hill Dictionary of Scientific and Technical Terms*.

The latest release, which should be available by the time you read this, will feature an updated menu-based interface and updated reference information. (All the charts, tables, diagrams, graphs, and formulas from the source books will be included.) You can access information by term or phrase, alphabetically, or by a topical table of contents (which can be used either graphically or textually). You can even select elements from a graphical representation of the periodic table. The package is a valuable time-saving tool for scientists and academics.

—Wendy Dugas Pérez

CONTINUES

THE TRAVELING CD-ROM: Five Choices

by Mitt Jones

As the popularity of laptops grows, so does the need for peripherals to travel with them. CD-ROM drives are no exception. Manufacturers have responded with a range of products that fill the needs of most laptop users, but not always as well as they might.

One of the more useful products to emerge in the last year rescues laptop owners without a SCSI port or ISA expansion slot. These can be serious deficiencies, even if you simply want to connect a full-size, desk-bound CD-ROM drive to a desk-bound laptop. Trantor Systems, the company that provides the 8-bit T128 SCSI adapter for several of the drives reviewed here, has solved the problem quite nicely with its \$179 Trantor MiniSCSI, a parallel-to-SCSI adapter that's built for travel.

The MiniSCSI plugs into any standard parallel port and provides both a pass-through parallel port and a SCSI port. All of this comes in a package that weighs only 2.5 ounces and measures 0.7 by 2.1 by 4.2 inches. Trantor rates the portable adapter for a maximum sustained transfer rate of 75 kilobytes per second. Although this is much slower than the rating of the T128 8-bit adapter, it's also much faster than the 15 kilobytes per second or so you could expect with a standard serial port. Trantor supports the adapter for use with most available and discontinued CD-ROM drives. Several vendors, including CD Technology and NEC Technologies, sell the Trantor adapter under their own names.

DRIVES ON THE GO

For those who actually need to move a CD-ROM drive between locations—a need that has become more common as CD-ROM technology has gathered momentum—the selection of downsized DC-capable drives has expanded and improved. At the high end, CD Technology's \$895 CD Porta-Drive Model T3201 continues a tradition of speed, quality, and compatibility that few drives can match, portable or oth-

erwise (see the review in this issue). With its optional \$300 external battery pack, which weighs approximately 1 pound, the 4.2-pound CD Porta-Drive can run for as long as 2 hours between charges. The Trantor parallel-to-SCSI

*PC Magazine looks
at portable CD-ROM
drives and
peripherals that
turn your desktop
drive into a
laptop's best
friend.*

adapter, which comes with the appropriate cable and drivers, has a list price of \$220.

The CD Porta-Drive measures a relatively compact 1.7 by 5.9 by 8.2 inches. But by the time you add the bulky external power supply/recharger and the battery pack, it can begin to seem a load too heavy to haul. In other words, this is a great solution if you need a high-performance drive that you can carry, but a rather trying one if you expect your CD-ROM drive to slip into your shoulder bag next to a notebook laptop.

For applications that demand portability, the \$599 NEC Intersect CDR-36 should be a top contender. The performance of this 500-ms. drive, which replaces the 1,500-ms. Intersect CDR-35, rates as mediocre at best. Our evaluation unit averaged approximately 60 KBps on PC Magazine Labs' Sequential Throughput tests and 45 KBps on the Random Throughput tests. Then again, the CDR-36 measures a scant 1 by 5.4 by 9 inches and weighs 2.2 pounds, for a total of 3.8 pounds with

its interface cable and smallish AC adapter. Add the nickel cadmium battery pack, which connects flush to the side of the machine, and the drive measures 1.6 inches wider, becomes 0.8 pounds heavier, and can operate for as long as 1.5 hours between battery charges.

The NEC Intersect CDR-36 comes with a headphone jack and volume control, but you're out of luck if you need RCA jacks. NEC Technologies lists the Trantor/NEC XT/AT SCSI adapter kit for the CDR-36 at \$199. The parallel-to-SCSI kit retails at \$149. NEC includes Trantor's Music Box CD-audio utility with each interface kit.

LOW-COST OPTIONS

At least two other companies, Philips Consumer Electronics Co. and Texel America, have announced other low-cost, low-speed portables. The Philips Magnavox drive is expected to sell at discount prices of about \$400 but promises little in the way of efficient throughput: The drive will reportedly ship with a proprietary serial adapter and a cache of only 4K. The Texel entry—model DM-7120—will internally house a nickel cadmium battery pack and the Trantor parallel-to-SCSI adapter. Production versions of the two drives were unavailable for evaluation at press time.

The future of portable CD-ROM will almost certainly include a stab at the 3.5-inch CD-ROM—a 200MB format small enough to work nicely into the laptop form factor. Verbatim recently announced that it has begun shipment of the disks, Sony is expected to introduce a U.S. version of a stand-alone reader that has gained popularity in Japan, and other companies are rumored to be working on the PC-compatible 3.5-inch drives. Given the history of CD-ROM, however, it is difficult to predict when real products will reach the market, how much they will cost, and how readily they will be embraced by buyers and the CD-ROM industry. ■

SEE US AT
NETWORK BOOTH
#1114 AND COMDEX
FALL BOOTH #1628 MAIN HALL

THE WORLD'S QUIETEST LINE PRINTER!

EUROLINE™

FINALLY! A LINE PRINTER SO QUIET

YOU CAN PUT IT RIGHT IN THE OFFICE.

- ▶ 48 DBA* (QUIETER THAN A LASER) AT 400 & 600 LPM
- ▶ LOWEST MAINTENANCE COST IN THE INDUSTRY

CALL US FOR A FREE BROCHURE AND ARRANGE
FOR A PERSONAL DEMONSTRATION.

800-468-8788

E 9922 MONTGOMERY DRIVE, SUITE #6, SPOKANE, WA 99206-4199

* RATED NOISE LEVEL OF 48DBA IS AVAILABLE AS AN OPTION. STANDARD RATED NOISE LEVEL IS 53DBA

CIRCLE 245 ON READER SERVICE CARD





TO YOU WITH

ZENITH
data systems 
Groupe Bull

1386 and i486 are trademarks of Intel Corporation.
Microsoft Windows and LAN Manager are trademarks of
Microsoft Corporation. NetWare is a registered trademark of
Novell, Inc. Banyan and VINES are trademarks of Banyan Systems,
Inc. SCO is a trademark of Santa Cruz Operations. ISC is
a trademark of International Systems Corporation. UNIX is a
registered trademark of American Telephone & Telegraph
Company.

Copyright © 1991 Zenith Data Systems Corporation.



NOW THE ZENITH DATA SYSTEMS DESKTOP PC LINE DOES MORE THAN EVER.

On any desk, PC power tends to follow a predictable path. Upwards. That's why maximum expandability is the idea behind the Zenith Data Systems desktop PC line.

And our versatile new PC LAN products are choice examples. The Z-486/33ET LAN Server offers you a wide range of expansion options and comes ready to support all leading networking standards.* Pair it with our Z-LS Diskless LAN Station for superior performance.

Or for expandability and advanced graphical computing right out of the box, choose our new Z-486SX/20E or Z-486/33E personal workstations with the *Seamless Solution*—pre-installed with Microsoft® Windows™ v. 3.0 plus a Microsoft mouse.

So connect with Zenith Data Systems. For more information and the name of your nearest Zenith Data Systems Medallion Reseller, call 1-800-523-9393 in North America.

OUR NEW PC LAN SYSTEM.

	Z-386SX/20	Z-486SX/20E	Z-486/33E	Z-486/33ET	Z-LS
Microprocessor	i386™SX - 20/10 MHz	i486™SX - 20 MHz	i486DX - 33 MHz	i486DX - 33 MHz	i386SX - 16 MHz
Co-Processor	Optional 80387SX	Weitek 4167 socket i486DX upgrade	Weitek 4167 socket	Weitek 4167 socket	Optional 80387SX
Memory (Std./Board Max.)	2MB/16MB	4MB/32MB	4MB/64MB	8MB/64MB	1MB/8MB
Expansion Slots	4 open 16-bit ISA	3 open 32-bit EISA	3 open 32-bit EISA	8 open 32-bit EISA	2 open 16-bit ISA
Hard Disk Drive	40MB or 80MB IDE	80MB or 200MB IDE	200MB or 400MB IDE	340MB half-height SCSI, 6 open half-height bays	Diskless, 40MB IDE optional
Ports	2 serial, 1 parallel	2 serial, 1 parallel	2 serial, 1 parallel	2 serial, 2 parallel, 1 mouse	2 serial, 1 parallel
Disk Drive Controller	Combined IDE connector/floppy controller	Combined IDE connector/floppy controller	Combined IDE connector/SCSI floppy controller	EISA bus master SCSI mass host adapter	IDE connector/floppy controller
Video	16-bit VGA card	16-bit VGA card	TGA/VGA	16-bit VGA card	16-bit VGA on board
LAN Features				Optional RAID 5 disk array software	Dual level ROM-based password protection



*The Z-486/33ET has been tested for compatibility with Novell NetWare® and Microsoft LAN Manager™

The Z-486/33ET has been submitted for testing and compatibility with Banyan® VINES™ and SCO™ and ISC™ UNIX®

CIRCLE 732 ON READER SERVICE CARD

Z-386SX/20



Z-486SX/20E



Z-486/33E



Z-486/33ET and Z-LS



POWER FROM A NEW PERSPECTIVE V.

A sale of encyclopedic proportions.

Save \$500!

THE TIME TABLE OF HISTORY: SCIENCE AND INNOVATION

A far-extending 6,000 story compendium from Xiphias of key events in science and technology. From the Big Bang to the Super Collider, all entries are completely cross-referenced with 1,000 multi-media graphics and stereo effects. It's the fifth best-selling CD-ROM product on the market!

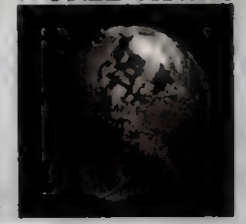
TIME TABLE OF HISTORY

SCIENCE & INNOVATION

THE SOFTWARE TOOLWORKS ILLUSTRATED

ENCYCLOPEDIA

WORLD ATLAS



World At Your Fingertips

THE SOFTWARE TOOLWORKS® WORLD ATLAS

You've got the whole world at your fingertips with the finest interactive printable CD-ROM that puts you just a "click" away from 240 maps of the world, individual countries, regions and counties. Incorporating geographic, demographic, economic, government and communications data in a brilliant presentation will get high marks with this indispensable Atlas/Almanac world fact book.

THE NEW GROLIER ELECTRONIC ENCYCLOPEDIA™

Aviation to zebras, this encyclopedia captures the sights and sounds of information in living color. It contains 33,000 articles, 1500 full-color graphics including 250 maps and stereo sounds that speak volumes for its capabilities

Very rarely does a new product come along that turns an industry on its ear.  Such is the case of CD-ROM with its massive capacity that allows you to experience the exhilaration of living color, sound and special effects. So you're in for one of the most exciting interactive, sensory experiences you've ever had sitting down. 

Get three of the current top ten CD-ROM software titles: *The New Grolier Electronic Encyclopedia™*, *The Time Table of History* and

The Software Toolworks® World Atlas, with your special discounted purchase of the high-performance NEC Intersect™ CDR-36 portable CD-ROM reader. 

Act now and save \$500* from the manufacturer's suggested retail price on this exclusive package at just \$749* for Macintosh and \$849* for IBM XT/AT and \$899* for PS/2. Or, upgrade to the fastest CD-ROM reader on the market, the NEC CDR-73 at the low price of \$1,099* for Macintosh, \$1,199* for IBM XT/AT and \$1,299* for PS/2. 

This essential reference package includes an Interface Kit for either Macintosh or IBM, headphones with CD-audio software diskette to play stereo music CD's, and quick-install program diskette which installs the reader and the three CD titles instantly. The big plus is toll-free telephone access to the NEC hotline for hardware or software technical assistance and a 2-year limited hardware warranty.  The supplies for this promotion are limited, so act before January, 15, 1992.

MICROAGE
602-968-3168

MULTIPLE ZONES, INC.
800-248-0800

COMP USA
800-451-7638

COMPACT DISK PRODUCTS
800-MEGABYT
(800-634-2298)

PC WAREHOUSE
201-587-0910

MAYA COMPUTER COMPANY
800-541-2318

*Suggested retail price, actual price may change depending on dealer

C&C Computers and Communications

CIRCLE 157 ON READER SERVICE CARD

NEC

CD-ROM DRIVES

not supplying the CD audio utility because Microsoft provides one in Multimedia Extensions 1.0 for Windows, which CD Technology intends to offer. If you buy the CD Porta-Drive before the extensions become available, you will have to find a CD audio utility elsewhere or purchase Trantor Systems' *Music Box* from CD Technology for \$60.

As with most vendors in this roundup, CD Technology offers several interface kits for its drive. Every drive ships with the Macintosh CD-ROM device driver, though not the \$20 cable. The PC-XT/AT option, which comprises the Trantor T128 SCSI adapter and cable, lists at \$120. The IBM PS/2 option lists at \$320. The Trantor parallel-to-SCSI adapter, which allows the drive to be connected to any standard parallel port, costs \$220 with cable. Other options include the \$300 battery pack, additional AC adapters/chargers for \$100, a carrying bag for \$60, and a five-pack of caddies for \$50. CD Technology lists software device driver upgrades at \$50, a price many buyers will deem too expensive.

CD Technology provides a standard one-year parts-and-labor warranty for the CD Porta-Drive but adds a novel twist: If the drive fails to play any of your CD-ROM disks correctly within the first 30 days, the company will accept the drive back for a full refund. In other words, the Porta-Drive is compatible across all PC and Macintosh CD-ROM formats, a claim most other drives can now also make.

Despite its lack of a power indicator and a CD audio utility, the CD Porta-Drive stands as an excellent choice if you want a high-performance multimedia-capable CD-ROM drive and you are willing to pay for it. If you also happen to want a drive that is compact, truly portable, or both, this is the only drive currently on the market that fills the bill.

CHINON AMERICA INC.

Chinon CDX-431

by Greg Pastrick

Sometimes reality doesn't match promise. The Chinon CDX-431 has all the features and functions to make it truly enticing to the consumer. The unit is small, light, easily installed, available for 10 to 15 percent off retail for OEMs, and backed by solid customer support and a program under development to offer a selection of

**The CD-Porta Drive
is an excellent
choice if you need
a multimedia drive.**

CD titles at reduced rates. The only thing missing in this \$795 SCSI device is an appropriate throughput rate, based on our tests, to match its competition.

The CDX-431 cannot be written off on speed alone, since by nature the CD-ROM beast is generally slow, but the CDX's slow throughput numbers are notable. This drive is but one member of a family of CD-ROM/CD audio products from Chinon America that includes the \$650 CDS-431 internal drive, the \$795 CDA-431 Macintosh-compatible drive, and the \$895 CDC-431 with hand-held remote audio control. The CDX-431 owes its compact dimensions and under-5.5-pound weight to a 23-watt external power adapter. The CDX-431 is built on a Chinon mecha-



Chinon CDX-431

Chinon America Inc., Information Equipment Division, 660 Maple Ave., Torrance, CA 90503; 213-533-0274, 800-441-0222 (TechniCare support).

List Price: With adapter, card, cable, \$795. Chinon CDS-431 internal drive, \$650.

Requires: IBM-XT, AT, or compatible; 512K RAM; 50K hard disk; DOS 2.1 or later. VGA graphics adapter recommended.

In Short: Despite its full functions, compact construction, and technical support, the Chinon CDX-431 is a poor choice if you base your purchase on throughput alone. Chinon's SCSI drive had one of the slowest raw access times on our tests. If speed's the need, look elsewhere.

CIRCLE 615 ON READER SERVICE CARD

CD-ROM TITLES (CONTINUED)

WRITERS' AIDS



**Languages of the World,
National Textbook Co.
(Lincolnwood, Illinois), \$950.**

Imagine having your own interpreter on call 24 hours a day. This disk brings multilingual capabilities to your PC. Its 18 dictionaries let you look up definitions, translations, synonyms, antonyms, and idioms for words in any of 12 languages (Chinese, Danish, Dutch, English, Finnish, French, German, Italian, Japanese, Norwegian, Spanish, and Swedish).

You can select a term in any one of these languages and search for its translation or full dictionary definition in any of the others. You can also use the program's automatic cross-referencing features to translate between two languages that are not covered by a specific dictionary. For example, you can get the Chinese equivalent of a French word, even though the disk has no Chinese/French dictionary. You can insert your findings directly from the dictionary database into your word processing document.

Though the installation of this memory-resident program is not always straightforward and the interface is sometimes not intuitive, the disk is a rich store of information and a great convenience to those using foreign languages.

—Wendy Dugas Pérez

Microsoft Bookshelf 1991, Microsoft Corp. (Redmond, Washington), \$195.

Those who already know and love the original version of *Microsoft Bookshelf* may have mixed emotions about two revisions. The new versions lack some of the appealing features in their predecessors, including the U.S. ZIP Code Directory, *The Chicago Manual of Style*, and the Houghton Mifflin Usage Alert and Spelling Verifier and Corrector.

On the upside, a new search engine cuts access times in half, and three new general reference sources join what remain of the old sources.

Microsoft Bookshelf 1991, the text-only DOS version, sports a new menu-based interface and is a much snappier performer than its predecessor, but it looks and works much the same. Two new sources—*Concise Columbia Encyclopedia* and *Concise Columbia Dictionary of Quotations* join four of the original titles: *American Heritage Dictionary*, *Rogert's II: The New Thesaurus*, *Bartlett's Familiar Quotations*, and a 1991 version of *The World Almanac and Book of Facts*.

A multimedia Windows version (unavailable for our review) will add the *Hammond World Atlas* and promises to offer audio word definitions, audio quotations, and animated encyclopedia illustrations. Both versions are good all-around reference sources for students of all ages.

—Mitt Jones

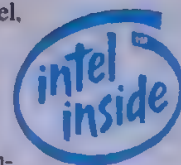
CONTINUES

"Insight
can put together
a system...to cover
just about any personal
or workgroup computing needs"
PC Magazine June 25, 1991



Insight Delivers . . .

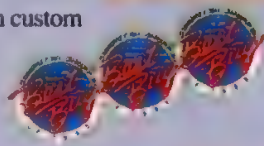
■ **Insight Delivers *Solutions*.** Total solutions. For business, home or travel, Insight will match you with the computing power you demand - at a price you won't believe! These fast, great-looking systems are fully configured to exceed your toughest standards - without breaking the bank. Each is loaded with high-quality brand-name components and backed by an unbeatable Product Support Program. So when you need the most in high-performance value, the answer is simple- Get Insight!



■ **Insight Delivers *Satisfaction*.** Complete satisfaction. Each Insight system is backed by Insight's 30-Day "Worry-Free" Guarantee, One-Year Parts and Labor Warranty, and Toll-Free Sales and Technical Support seven days a week. It's all part of Insight's commitment to quality, performance and value.



■ **Insight Delivers *Experience*.** Years of experience. We've teamed up with our sister company, Hard Drives International, winner of PC Magazine's Editor's Choice and Computer Shopper's Best Buy in 1988, 1989, and 1990. Together, this team gives you maximum flexibility in advanced storage. From hard drives to optical storage, Insight and Hard Drives International can custom configure your perfect mass storage solution.



■ **Insight Delivers *Quality*.**

In everything we do. You'll find buying from Insight a pleasant experience. Our friendly, knowledgeable salespeople are dedicated to giving you the highest level of service, carefully matching you with the perfect system. Your computer is built to order, then rigorously tested to ensure years of worry-free performance. When everything is ship-shape we make sure you get it fast - direct to your door via Federal Express Delivery Service. Isn't it time you got the personal attention you deserve? With Insight's value, quality, selection, and service, the choice is clear...Get Insight.



- **Insight Delivers *Commitment!***
- 30-Day Worry-Free Guarantee
- One-Year Parts and Labor Warranty
- Complete Documentation
- Toll-Free Sales, Tech & Service
- Express Parts Replacement
- Systems Built to Order
- Low Cost Upgrades
- Federal Express Delivery
- Your Satisfaction is Built In!

Insight

Call today!
Open 7 days a week.
Ask about our
new *Live* systems!
800-488-0004
Your satisfaction is built in.



386SX-20MHz

 \$1595

- 4Mb of RAM
- 16-bit 1Mb SVGA card
- MS DOS
- 80Mb 17ms 32K Cache IDE Hard Drive
- 14" Super VGA Color Monitor
- Enhanced 101 Key Keyboard
- 1.44Mb 3.5" Floppy Drive
- 1.2Mb 5 1/4" Floppy Drive
- 2 Serial Ports, 1 Parallel Port

386SX-20MHz Notebook

\$1695

- 2Mb of RAM
- External VGA port
- NiCad battery pack
- 20Mb 23ms IDE Hard Drive
- 2 Serial Ports, 1 Parallel Port
- 83-key imbedded Keyboard
- 1.44Mb 3.5" Floppy Drive
- 10" backlit grey scale VGA display
- Add \$299 for 60Mb hard drive
- AC adapter / recharger
- External keyboard port

386-25MHz

  \$1795

- 4Mb of RAM
- 16-bit 1Mb SVGA card
- MS DOS
- 130Mb 15ms 64K Cache IDE Hard Drive
- 14" Super VGA Color Monitor
- Enhanced 101 Key Keyboard
- 1.44Mb 3.5" Floppy Drive
- 1.2Mb 5 1/4" Floppy Drive
- 2 Serial Ports, 1 Parallel Port
- Add \$199 for 210Mb HD

386-33MHz Cache

  \$1995

- 4Mb of RAM
- 16-bit 1Mb SVGA card
- 64K RAM Cache
- 130Mb 15ms 64K Cache IDE Hard Drive
- 14" Super VGA Color Monitor
- Enhanced 101 Key Keyboard
- 1.44Mb 3.5" Floppy Drive
- 1.2Mb 5 1/4" Floppy Drive
- 2 Serial Ports, 1 Parallel Port
- MS DOS
- Add \$199 for 210Mb HD

486-25MHz ISA Cache

  \$2495

- 4Mb of RAM
- 16-bit 1Mb SVGA card
- 64K RAM Cache
- 130Mb 15ms 64K Cache IDE Hard Drive
- 14" Super VGA Color Monitor
- Enhanced 101 Key Keyboard
- 1.44Mb 3.5" Floppy Drive
- 1.2Mb 5 1/4" Floppy Drive
- 2 Serial Ports, 1 Parallel Port
- MS DOS
- Add \$199 for 210Mb HD

486-33MHz ISA Cache

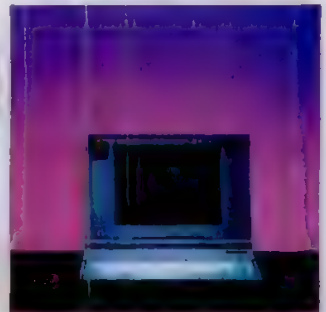
  \$2695

- 4Mb of RAM
- 16-bit 1Mb SVGA card
- 64K RAM Cache
- 130Mb 15ms 64K Cache IDE Hard Drive
- 14" Super VGA Color Monitor
- Enhanced 101 Key Keyboard
- 1.44Mb 3.5" Floppy Drive
- 1.2Mb 5 1/4" Floppy Drive
- 2 Serial Ports, 1 Parallel Port
- MS DOS
- Add \$199 for 210Mb HD

486-33MHz EISA Cache

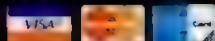
 \$9995

- 16Mb of RAM
- 16-bit 1Mb VGA card
- 64K RAM Cache
- Int. 600Mb CD-ROM
- 1 Gig (1050Mb) 14ms SCSI Hard Drive
- 14" Super VGA Color Monitor
- 32-bit Caching Ctrl., 2-8Mb RAM
- 1.3 Gig DAT Tape Drive
- 1.44Mb 3.5" Floppy Drive
- 1.2Mb 5 1/4" Floppy Drive
- 2 Serial Ports, 1 Parallel Port
- Enhanced 101 Key Keyboard
- MS DOS



800-488-0004

Insight Computers
1912 W. 4th St. Tempe, AZ 85281
602-350-1176
FAX 602-350-1182
National Accounts 800-733-0882



Insight

Prices & availability subject to change without notice. P.O.s accepted from qualified buyers. 30 Day Guarantee conditions shipping and handling charge is not refundable & Product must be undamaged and in original condition. Insight Distribution Network, Inc. is not liable for damage due to misstatement or typographical errors. The Intel Inside logo is a trademark of Intel Corporation. All trademarks and trademarks herein are properties of their respective owners.



*Offered only with the purchase of an Insight Computer. Insight Windows is Microsoft compatible. Super-interlaced monitor is an upgrade to the standard monitor and is not available on the Insight 386SX Line. Microsoft Windows 3.0 is a Licensed Version.

CKT

HARDWARE

CD-ROM DRIVES



CD-ROM DRIVES: SUMMARY OF FEATURES

Products listed in ascending price order

	Tandy CDR-1000 CD-ROM Drive	Allegro Series Model PXCD650S	GenSTAR 2000	Texel DM-5021	Sony CDU-7205	LMSI CM 231	CD Porta-Drive Model T3201
List price	\$399.95	\$479.00	\$499.00	\$529.00	\$699.00	\$783.00	\$795.00
PHYSICAL CHARACTERISTICS							
Mechanism manufacturer	Tandy	Sony	GoldStar	Texel	Sony	Philips/LMSI	Toshiba
External/internal	□/■	■/■	■/□	■/■	■/□	■/■	■/■
External case characteristics:							
Dimensions (HWD, in inches)	N/A	2 x 6 x 12	3 x 13.5 x 11	1.7 x 5.8 x 14.8	2 x 7 x 13	3.4 x 12.5 x 11.3	1.7 x 5.9 x 8.2
Weight (pounds)	N/A	5.8	38.2	6	6.4	9	4.2
Length of supplied cables	N/A	3 ft.	3 ft. 2 in.	3 ft.	3 ft. 6 in.	3 ft. 2 in.	6 ft.
Switchable voltage (110/220)	N/A	■	□	■	□	■	■
Power/busy indicators	□/■	□/■	■/■	□/■	■/■	■/■	□/■
Caddy manufacturer	N/A	Sony	Sony	Sony	Sony	Philips	Sony
Operates vertically	□	■	□	□	■	□	■
Audio support:							
Headphone jack	■	■	■	■	■	■	■
RCA jacks	■	■	■	□	■	■	■
Volume knob	■	■	■	■	■	■	■
PERFORMANCE RATINGS							
Buffer size	N/A	8K	32K	64K	8K	64K	64K
Average access time	1,000 ms.	340 ms.	450 ms.	340 ms.	340 ms.	400 ms.	325 ms.
Data transfer rate:							
Average or sustained	150 KBps	150 KBps	150 KBps	150 KBps	150 KBps	153.6 KBps	150 KBps
Burst	1,400 KBps	600 KBps	600 KBps	153.6 KBps	600 KBps	1,000 KBps	1,500 KBps
Average latency:							
Inner	Info not available	55 ms.	66 ms.	56 ms.	55 ms.	60 ms.	60 ms.
Outer	Info not available	130 ms.	150 ms.	119 ms.	130 ms.	155 ms.	120 ms.
Mean time between failures (hours)	10,000	25,000	20,000	30,000	25,000	35,000	50,000
CONTROLLER CHARACTERISTICS							
Controller manufacturer	Tandy	Procom	GoldStar	Trantor	Sony	Future Domain	Trantor
Interface type	Proprietary	Proprietary	Proprietary	SCSI	IDE	SCSI	SCSI
Interface board (ISA):							
IRQs supported	2, 3, 5	None	3, 5, 7	3, 5-7	2-5	3, 5	3, 5, 7
Number of selectable addresses	5	64	256	4	19	3	4
Maximum units in daisy chain	N/A	2	8	7	4	7	7
Alternate interfaces:							
Micro Channel	□	■	□	■	□	■	■
Macintosh	□	■	□	■	□	■	■
SOFTWARE SUPPORT							
Device driver supplier	Tandy	Procom	GoldStar	Trantor	Sony	LMSI	Trantor
Version tested	1.00	1.0	2.20	1.30	2.20	2.2	1.2
RAM used	64K	6K	33K	10K	9K	2K	16K
OS/2 support	□	□	□	□	□	□	■
Includes MS/DOS CD-ROM extensions	■	■	■	■	■	■	■
Includes Multimedia Extensions for Windows	□	□	□	□	□	□	□
Installation software supplied	■	■	■	■	■	■	■
CD-ROM disks bundled with drive	None	6	None (or 6 for \$200)	None	6	None	1

■—Editors' Choice ■—Yes □—No

N/A—Not applicable: The product does not have this feature.

HARDWARE

CD-ROM DRIVES

Chinon CDX-431	Toshiba TXM-3301-E1	Todd TCDR-6000	NEC Intersect CDR-73	Sony CDU-7211	Hitachi CDR-1750S	PLI CD-ROM Drive	IBM PS/2 External CD-ROM Drive
\$795.00	\$799.00	\$805.00	\$949.00	\$949.00	\$965.00	\$1,099.00	\$1,150.00
Chinon ■/□	Toshiba ■/■	Hitachi ■/■	NEC ■/■	Sony ■/■	Hitachi ■/■	Sony ■/■	IBM ■/■
2.2 x 6 x 10 5.5 4 ft. 10 in. □	2.7 x 8.7 x 9 4.3 4 ft. ■	2.2 x 6 x 13.5 7.9 4 ft. □	3 x 9 x 9.5 7.5 3 ft. 3 in. ■	2 x 7 x 13 6.5 4 ft. ■	2.9 x 9 x 12.8 9.3 4 ft. 2 in. □	2.5 x 10 x 10 6 1 ft. 6 in. □	1.6 x 5.8 x 8 3.5 N/A ■
■/■ Sony ■	■/■ Sony ■	■/■ Sony □	■/■ Sony ■	□/■ Sony ■	■/■ Sony □	□/■ Sony ■	■/■ IBM ■
■	■	■	■	■	■	■	■
■	■	□	■	■	■	■	■
■	■	■	■	■	■	■	■
32K 350 ms.	64K 325 ms.	32K 340 ms.	64K 300 ms.	64K 380 ms.	64K 320 ms.	64K 380 ms.	64K 380 ms.
150 KBps 2,200 KBps	153.7 KBps 1,500 KBps	175.2 KBps Info not available	150 KBps 1,500 KBps	150 KBps 1,200 KBps	153.6 KBps 1,300 KBps	150 KBps 1,536 KBps	150 KBps 1,500 KBps
70 ms. 150 ms. 25,000	60 ms. 150 ms. 30,000	50 ms. 150 ms. 25,000	35 ms. 75 ms. 20,000	55 ms. 130 ms. 25,000	55 ms. 150 ms. 20,000	55 ms. 130 ms. 25,000	56.6 ms. 150 ms. 55,000
Chinon SCSI	Future Domain SCSI	Todd Proprietary	Trantor/NEC SCSI	Future Domain SCSI	Future Domain SCSI	Trantor SCSI	IBM SCSI
None 16	3, 5 4	3 or 5 64	3, 5, 7 4	None 4	3, 5 4	3, 5-7 4	None None
7	7	8	7	7	8	7	7
□ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ □
Chinon 2.20 31K □	Future Domain 2.14 23.8K □	Hitachi 2.20 25.4 □	Trantor 2.20a 8K □	Future Domain 2.13 28K □	Future Domain 2.13 21K □	Trantor 1.28 10K □	IBM 1.01 10K ■
■	■	■	■	■	■	■	□
□	■	■	□	□	□	□	□
■	■	■	■	■	■	■	■
1	1	None	None	None	None	None	None

Carbon fiber reinforced case reduces the thickness and weight while increasing its strength.

Large, bright, easy-to-read 9.5" diagonal display.

Nickel Hydride battery works for over 3 hours on a 2 hour charge.

AutoResume lets you start where you left off without rebooting.

Includes MS-DOS® 5.0.

20MHz 386SX 32-bit microprocessor.

12 dedicated function keys.

150-pin expansion bus connector for Desk Station IV docking station.

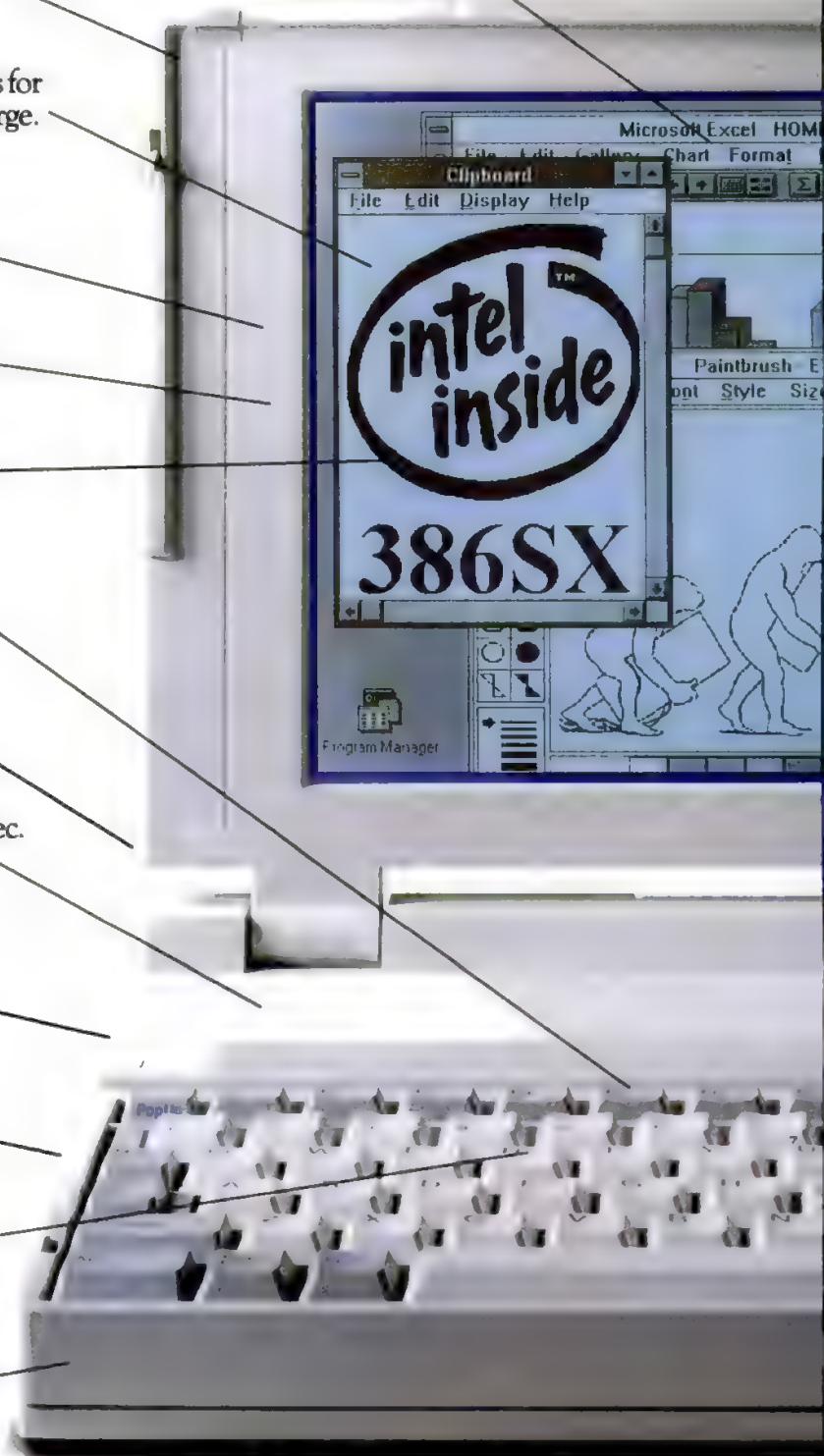
60MB hard disk drive with 19 msec. average access time.

A credit-card sized memory card lets you add up to 8MB of RAM yourself.

Port for numeric keypad or 101-key keyboard adapter.

Full function, standard spaced, 82-key keyboard.

2MB RAM standard.



WE JUST REWROTE

Introducing the T2200SX. At just 5.5 pounds, it's everything you've ever wanted

640 x 480 VGA display.

Fluorescent side-lit black and white LCD display.

Dimensions: 11.7"W x 1.6"H x 8.3"D.
Fits into half of a briefcase.

T2200SX

Hypertext on-line documentation.

Entire computer weighs 5.5 lbs.
including battery.

Intelligent power supply with
battery "gas gauge."

Low battery warning light and
audible alarm.

Integrated numeric keypad.

Built-in slot for credit card
size internal modem.

8 dedicated cursor control keys;
arrow keys arranged in easy-to-use
inverted "T" pattern.

1.44MB, 3½" diskette drive.

PS/2® style mouse port.

In Touch with Tomorrow
TOSHIBA

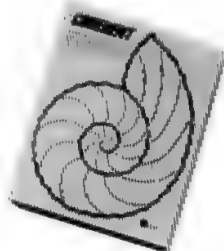
© 1991 Toshiba America Information Systems, Inc.

THE NOTEBOOK.

in a notebook computer, and less. For details, call 1-800-457-7777.

CIRCLE 379 ON READER SERVICE CARD

Everything You Ever Wanted In UNIX. And Less. \$99.95*



It's Coherent! A virtual clone of UNIX, independently developed by Mark Williams Company.

Like the original UNIX, Coherent takes the tenet that small is beautiful and embodies it in a powerful multi-user, multi-tasking development system. With nearly 200 UNIX commands.

"Mark Williams Co. seems to have mastered the art of illusion; Coherent comes so fully qualified as a UNIX clone, you find yourself thinking 'I can't believe it's not UNIX.'"

—Sean Fulton, UNIX Today!

LESS IS MORE!	MWC COHERENT Version 3.1	SCO XENIX 286 Version 2.3.2
No. of Disks	4	21
Kernel Size	64K	198K
Suggested Disk Space	10 meg	30 meg
Min. Memory Required	640K	1-2 meg
Performance*	38.7 sec	100.3 sec
Price	\$99.95	\$1495.00

*Byte Exec'd benchmark, 1000 iterations on 20 MHz 386. Hardware requirements: IBM PC/AT or 286 or 386 based compatibles, 1.2 meg 5¼" or 1.4 meg 3½" floppy, and hard disk. Does not run on Microchannel machines.

For everything you ever wanted in UNIX—and less—order Coherent today!

1-800-MARK WMS
(1-800-627-5967 or 1-708-291-6700)
FAX: 1-708-291-6750
60-DAY MONEY BACK GUARANTEE!



**Mark Williams
Company**
60 Revere Drive
Northbrook, IL 60062

*Plus shipping and handling. Coherent is a trademark of Mark Williams Company. UNIX is a trademark of AT&T. XENIX is a trademark of Microsoft.

CD-ROM DRIVES



PERFORMANCE TESTS: CD-ROM DRIVES

In our throughput tests, the CD-ROM drives fell into two classes of performance, with one exception. The very fast NEC Intersect CDR-73 was in a class by itself.

The line dividing the slow and fast groups can be seen between the LMSI CM 231 and the Texel DM-5021.

WHAT THE NUMBERS MEAN

If your basis for comparison in mass-storage devices is the hard disk, whose sequential throughput can get as high as 800 kilobytes per second, then you will find all of these drives slow.

The real slowpokes—the NEC Intersect CDR-36, the Chinon CDX-431, Genesis's GenSTAR 2000, Procom's Allegro Series Model PXCD650S, the Todd TCDR-6000, and the Tandy CDR-1000 CD-ROM Drive—have throughput that generally peaks at under 115 KBps with both sequential and random access. This is somewhat puzzling in the case of the Allegro drive, which is identical to the better-performing Sony CDU-7205 except for some circuitry on the interface that the company claims should have a negligible impact on throughput. The Tandy almost manages to keep up with the middle of the pack on sequential throughput, but its 1-second access time really bogs it down on random access.

At the other end of the spectrum, the NEC Intersect CDR-73, with its superior mechanism, manages to achieve an average sequential throughput of about 220 KBps (its average latency, or the time it spends finding a location on a disk, ranges from a third to a half that of the

other drives). And although its minimum random throughput is matched by several other drives, it also peaks at a higher rate than many drives reach performing sequential operations. The rest of the drives all perform similarly, and about as expected, with average sequential throughputs of about 150 KBps and average random throughput of about half that rate. Random throughput is generally lower than sequential throughput because the bottleneck during random accesses is the drive mechanism, whereas the bottleneck for sequential accesses tends to be the interface; it's usually easier and therefore cheaper to design a fast interface than a fast, durable mechanism.

We ran the Sequential Throughput tests on a variety of file types, but performance differences among them were negligible. On the Random Throughput tests, performance differences across various file types ran as high as 20 KBps, but the relative performance of the drives remained the same. Note that throughput increases as block size increases, and that it peaks at 64K because the block size coincides with the block boundary and the controller does not have to worry about calculating offsets during retrieval.

HOW WE TESTED

PC Magazine Labs performed these tests on Compaq Deskpro 386/25e's with 8MB RAM, using the default interface settings where possible. The IBM drive was tested on a 25-MHz PS/2 Model 70 using the IBM 32-bit SCSI adapter. Although we used the default buffer size allocated to MSCDEX.EXE on installation (the /m parameter), note that performance can sometimes be improved slightly by increasing the number of buffers.

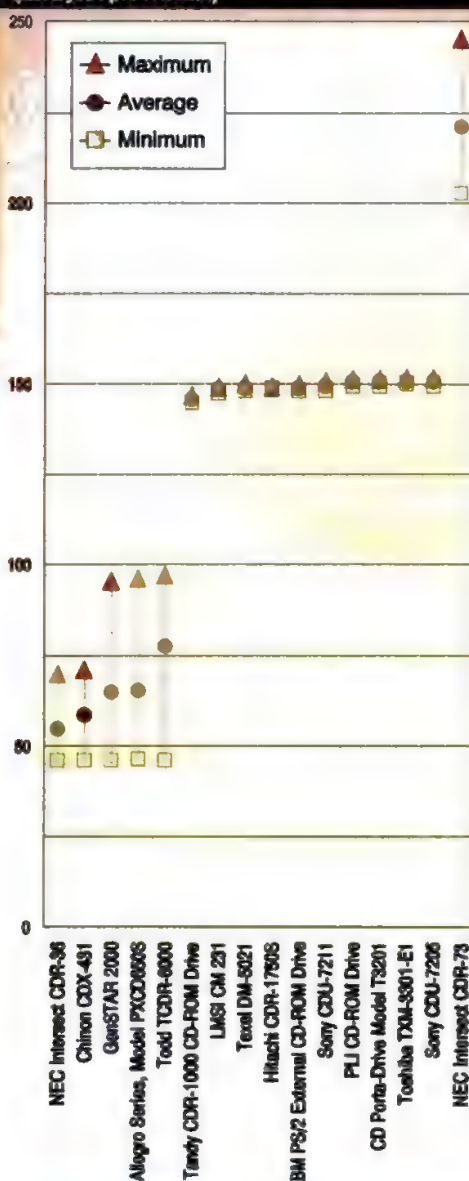
Higher scores represent better performance.

SEQUENTIAL THROUGHPUT (kilobytes per second)

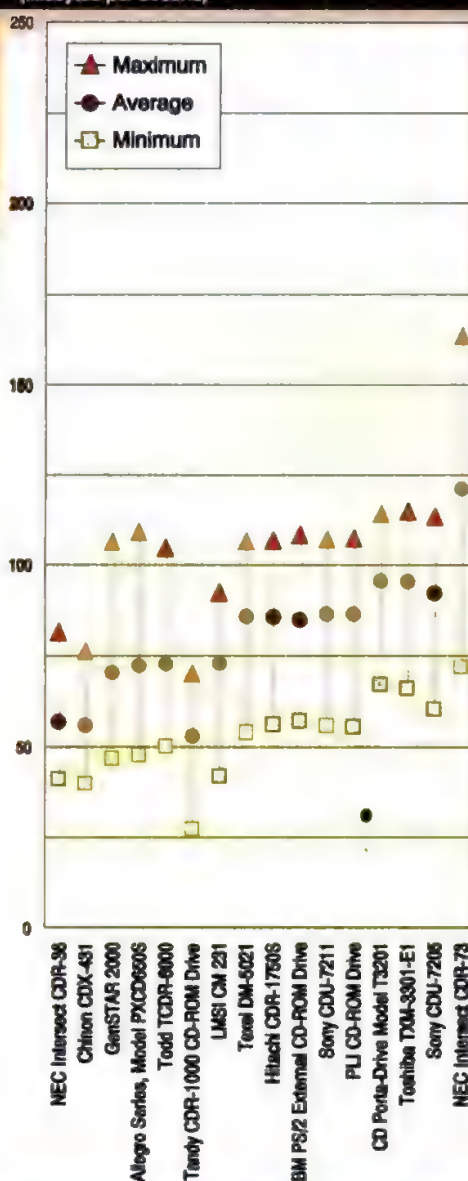
Block Size	NEC Intersect CDR-36	Chinon CDX-431	GenSTAR 2000	Allegro Series, Model PXCD650S	Todd TCDR-6000	Tandy CDR-1000 CD-ROM Drive
16K	46.09	46.15	46.27	46.44	46.24	145.12
32K	46.23	46.22	46.29	46.53	70.74	146.15
64K	69.98	70.08	95.27	96.08	96.02	146.96
66K	55.90	70.89	71.05	71.48	96.95	144.99

Block Size	NEC Intersect CDR-36	Chinon CDX-431	GenSTAR 2000	Allegro Series, Model PXCD650S	Todd TCDR-6000	Tandy CDR-1000 CD-ROM Drive
16K	45.04	41.96	55.04	58.00	50.33	27.27
33K	41.34	40.12	46.79	47.81	54.61	46.35
64K	81.61	76.41	106.43	109.10	104.64	68.32
66K	58.41	64.38	73.43	74.56	81.88	70.11

Sequential Throughput (kilobytes per second)



Random Throughput (kilobytes per second)



■ The **Sequential Throughput** is calculated by measuring the average time required to read 1.6MB of contiguous binary data in block sizes of approximately 16K, 32K, 64K, and 66K; sequential throughput reflects the drive's performance during such operations as loading programs and large data files. We performed the test at a variety of block sizes to reflect the fact that different application software packages retrieve data differently. (Please note that our sequential throughput measurement is not quite the same as the sustained transfer rate that defines suitability for running digitized video under the MPC specification.)

■ The **Random Throughput** is calculated by measuring the average time required to perform noncontiguous reads of 1.6MB of ASCII data in block sizes of approximately 16K, 32K, 64K, and 66K; this reflects the drive's performance when searching through databases and jumping from one hypertextual link to another. We performed the test with a variety of block sizes to reflect the fact that different application software packages retrieve data differently. The results for an ASCII file, reported here, reflect the worst performance but the most common file type for this operation.

LMSI CM 231	Teac DM-5021	Hitachi CDR-1750S	IBM PS/2 External CD-ROM Drive	Sony CDU-7211	PLI CD-ROM Drive	CD Porta-Drive Model T3201	Toshiba TXM-3301-E1	Sony CDU-7205	NEC Intersect CDR-73
148.68	148.14	148.68	149.35	149.90	150.45	151.14	150.87	151.14	214.17
149.21	148.13	149.08	148.67	148.13	151.42	151.42	151.70	151.70	202.77
147.51	150.16	149.45	150.02	149.45	149.45	149.45	150.16	149.45	245.32
148.94	149.35	148.67	148.14	150.86	151.42	151.42	150.86	151.42	222.00

LMSI CM 231	Teac DM-5021	Hitachi CDR-1750S	IBM PS/2 External CD-ROM Drive	Sony CDU-7211	PLI CD-ROM Drive	CD Porta-Drive Model T3201	Toshiba TXM-3301-E1	Sony CDU-7205	NEC Intersect CDR-73
42.21	54.00	56.11	57.07	55.77	55.45	67.04	65.93	60.26	71.92
65.01	77.12	77.08	73.17	77.78	77.34	87.26	87.05	84.34	102.91
91.87	106.56	106.76	108.30	107.10	107.46	114.25	114.83	113.39	163.42
92.50	106.13	103.16	101.51	105.91	105.65	114.03	113.82	111.00	146.15

CD-ROM TITLES (CONTINUED)

The Original Oxford English Dictionary on Compact Disc, Oxford Electronic Publishing (New York, New York), \$950.

The same qualities that make the 12-volume *Oxford English Dictionary* the most comprehensive dictionary of the English language make it an ideal subject for CD-ROM publication. The OED backs up each sense of a word with well-annotated quotations drawn from the literature of a millennium and devotes a good deal of space to field-specific usage and detailed etymologies. Add a sophisticated search engine, pack it all onto one compact disk, and you have an inexhaustible source of insight into the development and usage of the English language, not to mention a unique index to the literature and culture that developed along with it.

Like the printed version, the CD-ROM version allows you to look up any given word, but it adds the ability to search for occurrences of a word in context, quotations, or etymologies, and to narrow your searches by label (such as part of speech), quotation date, quotation author, or quotation work. You can save and recall queries, set bookmarks, enter and review annotations, and output whole entries or selected text to a file or printer.

Despite a few rough spots in the interface and documentation, this disk is a class act (with a price to match) that should appeal to anyone who feels the limitations of lesser dictionaries.—Mitt Jones



BUSINESS REFERENCE WORKS

Lists-On-Disc, American Business Information (Omaha, Nebraska), \$750 (annual subscription).

With more than 9 million entries, *Lists-On-Disc* is nothing less than a national electronic business yellow pages—with a running meter. Each listing includes the name, address, and phone number of companies in all 50 states, as well as the name and title of the owner or CEO, the number of employees, and a government-assigned Standard Industry Code (SIC) classification.

The disk's retrieval engine makes it easy to filter and combine sets of data to focus on an industry, geographic region, or both. You can output the information in a variety of formats including 3- by 5-inch cards, mailing labels, lists, and ASCII files.

You pay for this convenience, however: In addition to the \$750 annual subscription fee, a per-name charge is levied against a preset counter attached to the PC's parallel port. The counter starts at 1,000 and goes down each time you print or download a name. You can purchase names in increments of 1,000 for 12 cents apiece. Fortunately, merely viewing a name is free.—Don Trivette

CONTINUES

CD-ROM DRIVES

**Look to Chinon
for features and
support, not
speed.**

nism, operated by a Chinon controller, and driven by Microsoft/Chinon device software. The 8-bit interface card has switch-selectable addresses but does not use DMA. Like all of its family, the CDX-431 has two-channel audio capabilities with jacks for headphones and speakers. In addition, all the units support the standard Sony/Philips modes and read any disk written in the High Sierra format. Of course, the Macintosh unit also supports HFS formats.

On our Random and Sequential Throughput tests, the CDX-431 consistently proved to be one of the slowest drives of the group. Chinon's average access time rating of 350 milliseconds is slow by comparison with half the drives in the group, and its average inner latency specification is a good 20 ms. slower than the fastest CD drives. What's more, our personal experience bears out the findings of the test. In short, the drive plods when accessing pictures and text.

To Chinon's credit, the company offers what it calls the TechniCare service at no additional charge to the customers. The service includes a toll-free technical-support line, a BBS for downloading software updates and utilities, and a complete diagnostic utility disk. While it doesn't make up for the slow access time, it is a good feature to tack on to the standard warranty. On the CD-ROM software side, the company is launching the Chinon Crystal Collection, which should be available by the time you read this review. According to Chinon representatives, the collection will be a library of popular CD titles discounted for customers.

Product evaluation based on differences in seconds and milliseconds is always a little dicey, but the Chinon CDX-431 is so much slower than the top performers in the test group that it cannot be recommended for its throughput times. Look to the product line, features, and support, but do not expect speed.

GENESIS INTEGRATED SYSTEMS INC.

GenSTAR 2000

by Greg Pastrick

The GenSTAR 2000 lies on the low end of the performance and price spectrum for the CD-ROM drives tested in this review. The \$499 GenSTAR is controlled by a proprietary bidirectional Goldstar interface, while the drive itself is built on a Sony mechanism but in no way comes close to matching the access times posted by the Sony drives we evaluated in the test group. What distinguishes the GenSTAR is a bundling of software titles including the *Software Toolworks* series with *Illustrated Encyclopedia*, *Reference Library*, *U.S. Atlas*, and *World Atlas*, plus the National Geographic Society's *Mammals: A Multimedia Encyclopedia* and the *Sony CD-ROM Series Languages of the World* from Publishers Data Service Corp. \$699 buys the current bundled system; Genesis promises a custom bundling plan based on a menu-selection program by the time this issue goes to press. Other enhancements promised for the GenSTAR include an internal drive, a SCSI interface, and a 16-bit proprietary interface. If all this new hardware brings better performance and Genesis holds down the price, the GenSTAR will be worth looking at again by the end of the year.



GenSTAR 2000

Genesis Integrated Systems Inc., 1000 Sherland Pkwy., Minneapolis, MN 55426; 800-325-6582, 612-544-4445.

List Price: With interface kit, DOS extension software, drivers, audio software, audio cables, \$499; with six bundled CD-ROM titles, \$699.

Requires: IBM-XT, AT, or compatible; DOS 3.1 or higher. VGA graphics adapter and mouse recommended.

In Short: Aggressive pricing and a list of bundled CD titles are the premier features of the GenSTAR 2000. But the Genesis drive performs too slowly on our Random and Sequential Throughput tests to make the unit a recommended buy.

CIRCLE 616 ON READER SERVICE CARD

BEFORE YOU BUY
YOUR NEXT COMPUTER,
WE HAVE A COMPANY
WE'D LIKE TO SELL YOU FIRST.



THE REPUTATION

In little more than three years, PC Brand has risen to be one of the nation's top six **direct-sales manufacturers of IBM compatible personal** computers, components, and PC peripherals. In doing so, we've established an outstanding reputation that has instilled absolute confidence in thousands of PC owners today.

We're probably best known throughout the industry for our high quality products, aggressive pricing, comprehensive product warranty, and exceptional customer service and support programs. It's this overall commitment to the customer that has led the industry's **major** publications to recognize us as a premier PC system manufacturer.

Maintaining a solid reputation is important to us, because at PC Brand we understand that you want more than just a **dependable** computer, you want a company you can depend on, too.

CALL 1-800-PC BRAND

CUSTOMER SUPPORT

PC Brand prides itself on treating you like you're the only customer it has. We truly have your best interests at heart, and we have the customer programs to prove it.

Like a 30-day, no-questions money back guarantee on all our systems. An unparalleled 3 year prorated warranty, optional 2 or 5 year Service Plus Warranty, a technical support hotline board service, and unlimited toll-free technical support over the phone or fax. You also get on-site service in your home or office, as well as 24 or 36 month leasing options for qualified businesses.

And when you pick up the phone and call one of our sales representatives, you'll talk to a highly trained consultant who will gladly spend however long it takes to answer any questions you have. And it's reassuring to know you won't get any high pressured sales pitch, in fact you won't get a sales pitch at all. Our sales team is there strictly to help you, not hound you.

It's this dedicated customer support that has won us a great deal of recognition throughout the industry. But we don't do it for the industry, we do it for you.

CALL 1-800-PC BRAND

THE COMPUTER

At PC Brand, our goal is to provide you with computer systems at an outstanding price, constructed with only top quality components from the industry's leading manufacturers, and configured to your exact specifications. In fact, every PC Brand system can be custom configured with a variety of hard drive, video, and case options. You don't have to settle for less, or buy more than you need.

And from the sound of things, we're doing a pretty good job at reaching our goal.

THE PRICE

The reason our prices are so low is because we buy and sell direct. No middlemen, distributors, or dealers to increase the cost.

And the components for our systems are thoroughly tested for workmanship and compatibility in our own engineering department. Before any PC Brand system is shipped, it's also "burned in" for at least 24 hours to insure all components are working properly.

Simply put, we offer a full line of outstanding computers for rock bottom prices. And when you combine that with our customer support, technical service, unequalled warranty, as well as our overall commitment and reputation, there's no other company that can offer such a value.

You don't just buy a PC Brand computer, you invest in the whole company.

"great value... excellent performance ratio, high quality"
Computer Buyers Guide 386SX Product Review
"The best low cost alternative around"
PC Magazine, 386-25 Product Review



386/SX-16 NOTEBOOK†

- 16MHz 80386SX CPU • 2MB RAM (expandable to 16MB) • 20MB hard drive • 9" non-glare VGA screen with 32 grey shades • 1.44MB internal floppy drive
- Power management system for extended battery life • 3 hour battery pack • AC adapter • External keyboard connector • 8.6" D x 11" L x 2.1" H, 7.2 lbs
- 386/SX-20 Notebook with 40MB also available for \$2,665. Same system with 60MB... add \$330.

Lease for \$70/month*

\$1,799

†Quantities limited. Sold out when gone



386/SX-20 SYSTEM

- 20MHz 80386SX CPU operating at zero wait states
- 2MB RAM (expandable to 8MB) • 40MB hard drive • 14" monochrome grey scale monitor • 16 bit super VGA card • 1.2MB or 1.44MB floppy drive
- 1 parallel and 2 serial ports • 101 key click/tactile keyboard • DOS 5.0 • 200 watt power supply
- Desktop or Slimline case.

Lease for \$50/month*

\$1,299



386/33 CACHE SYSTEM

- 33MHz 80386DX CPU operating at zero wait states • Cache processor with 64K static RAM • 4MB RAM (expandable to 16MB) • 80MB hard drive
- 14" super VGA non-interlaced color monitor with 1024 x 768 resolution • 16 bit high performance super VGA card with 1MB video RAM • 1.2MB and 1.44MB floppy drives • 1 parallel and 2 serial ports
- 101 key click/tactile keyboard • DOS 5.0 • Windows 3.0 • Microsoft compatible mouse
- 200 watt power supply
- Desktop or Slimline case

Lease for \$96/month*

\$2,494

Shown in optional mini-tower case



486/33 ISA CACHE SYSTEM

- 33MHz 80486DX CPU operating at zero wait states • Built-in 8K 4-way set associative cache • High performance 128K secondary cache • 4MB RAM • 200MB hard drive • 14" super VGA non-interlaced color monitor with 1024 x 768 resolution
- 16 bit high performance super VGA card with 1MB video RAM • 1.2MB and 1.44MB floppy drives • 1 parallel and 2 serial ports • 200 watt power supply • 101 key click/tactile keyboard • DOS 5.0 • Windows 3.0 • Microsoft compatible mouse • Desktop case.

Lease for \$134/month*

\$3,484



486/33 EISA CACHE SYSTEM

- 33MHz 80486DX CPU operating at zero wait states • Built-in 8K 4-way set associative cache • 256K Hi-Performance direct-mapped secondary cache • 4MB RAM • 200MB 16ms Hard Disk w/cache • 14" Super VGA non-interlaced color monitor with 1024 x 768 resolution • 16 bit high performance Super VGA card with 1MB RAM, 256 colors • 1.2MB and 1.44MB floppy drives • 1 parallel and 2 serial ports • Desktop case with 200 watt power supply • 101 key click/tactile keyboard
- DOS 5.0 • Windows 3.0 • Microsoft compatible mouse.

Lease for \$186/month*

\$4,845

Same system in Tower Case (220 watt power supply) with 8MB RAM, 330MB drive w/EISA bus-mastering caching controller, 17" FST Color Monitor with 1024x768 resolution and enhanced Orchid Pro Designer™ IIs, w/1MB RAM and 32,768 true colors \$6,995.00 (lease for \$268.00)



CALL FOR INTRODUCTORY SPECIALS ON OUR NEWEST SYSTEMS.
CALL 1-800-PC BRAND

TECHNICAL SERVICE

Our Tech Team is one of the most thorough in the industry. That's probably one of the reasons we were rated #1 for service and support in a magazine evaluation of the "10 Best Mail Order Companies."

Another good reason is because our toll-free tech lines are manned by an extremely knowledgeable, experienced staff that's been trained to field any of the wide variety of questions you might have. They're experts in everything from specialized software to complicated LAN applications. We even have a Certified Novell Engineer on staff.

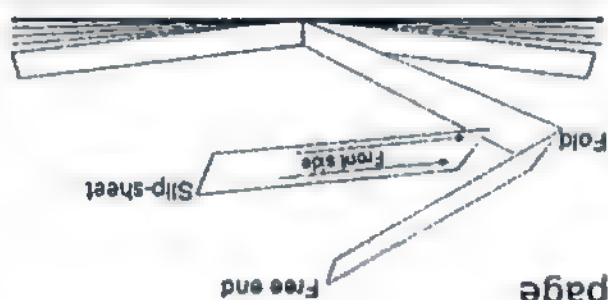
It's also reassuring to know our Tech Team solves 90% of all problems over the phone. And for those few problems that can't be worked out quite so easily, we'll send a qualified service technician to your office within 48 hours guaranteed, and most of the time within 24 hours.

The point is, you're not alone after the sale. We're there to help whenever you need it. In the words of *Personal Computing*, "PC Brand wants no unhappy customers. Its service and support policies help to insure that."

CALL 1-800-PC BRAND

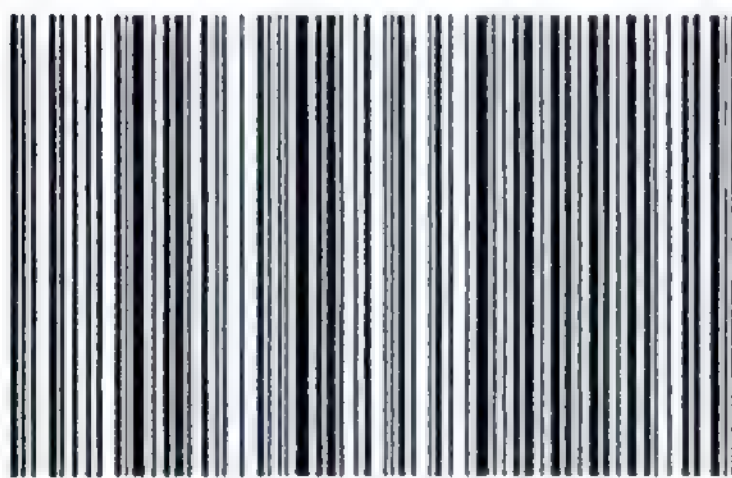


PC BRAND™



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet

Inverted Foldout slip-sheet

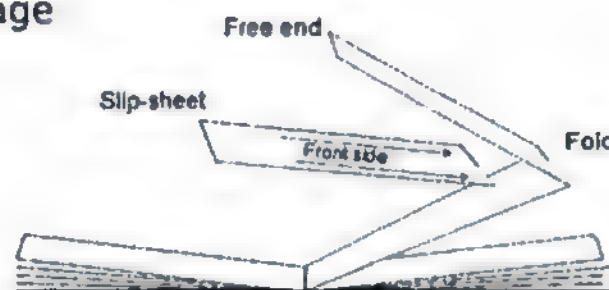


GbsSlipSheet-001

Folded edge of the page

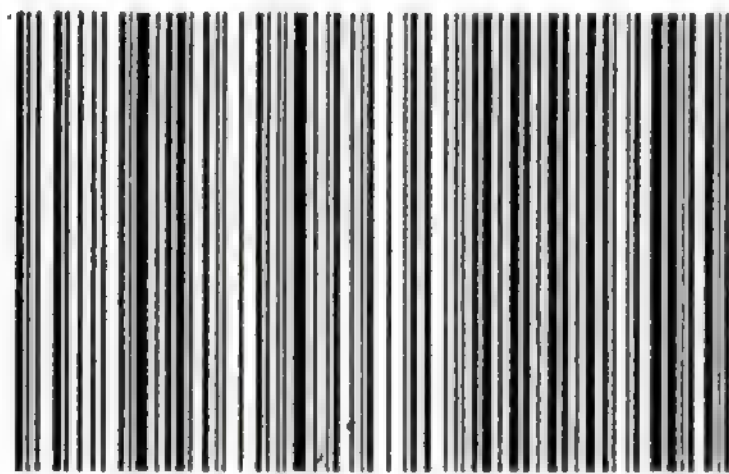
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
 3. Slice the folded edge
 4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-0018

Back

1. Follow instructions on the other side

THE WARRANTY

PC Brand offers you the ultimate protection for your computer.

That's because every one of our machines is backed with our industry-leading 5 year prorated warranty. A warranty that includes free on-site service for the first 90 days, 100% parts and labor coverage for the first year, as well as coverage on parts for years 2 through 5 at a declining percentage.

You'll also have access to our technical on-board service which is loaded with the information on your PC Brand system, the configuring software for maximum performance, helpful hints from our tech staff, and solutions from past support problems. All of this is entirely free with any PC Brand system.

And if you want even more security, you can get it with our industry-unique extended warranty plan called Service Plus. It offers complete 100% parts and labor coverage on your entire PC Brand system, from the motherboard to the monitor, for up to 5 full years.

With both the 2 or 5 year Service Plus Plans you also receive on-site service from TRW, the nation's leading full-service independent provider of maintenance and support services to the microcomputer industry.

With a 5 year Service Plus Plan you also automatically receive a guaranteed trade-in on your old PC Brand computer motherboard when you upgrade to a faster, more powerful PC Brand system in the future.

At what amounts to just a few dollars a month, this one of a kind PC Brand warranty is a tremendous value. And as far as we're concerned, it's just one more way we can show you how serious we are about standing behind our computers.

CALL 1-800-PC BRAND

OUR NEWEST SYSTEMS

386/SX-25 SYSTEM

- 25MHz 80386SX CPU operating at zero wait states
- 2MB RAM (expandable to 16MB) • 40MB hard drive
- 14" monochrome grey scale monitor • 16 bit super VGA card • 1.2MB and 1.44MB floppy drives • 1 parallel and 2 serial ports • 101 key click/tactile keyboard • DOS 5.0 • 200 watt power supply • Desktop or Slimline case. Same system as above with 80MB hard drive and VGA color...add \$290.

INTRODUCTORY OFFER
EXPIRES OCT. 31, 1991

\$1,585

Lease for \$61/month*



386/40 CACHE SYSTEM

- 40MHz 80386DX CPU operating at zero wait states
- 128K write-back cache • 4MB RAM • 100MB hard drive • 14" super VGA non-interlaced color monitor with 1024 x 768 resolution • 16 bit high performance super VGA card with 1MB video RAM • 1.2MB and 1.44MB floppy drives • 1 parallel and 2 serial ports • 101 key click/tactile keyboard • DOS 5.0 • Windows 3.0 • Microsoft compatible mouse • 200 watt power supply • Desktop or Slimline case. Same system as above with Orchid Pro Designer IIs featuring 32,768 true colors and 17" flat screen super VGA color monitor...add \$809.

INTRODUCTORY OFFER
EXPIRES OCT. 31, 1991

\$2,674

Lease for \$103/month*



SEE INSIDE FOR FULL LINE OF COMPUTER SYSTEMS.

*Monthly payments based on 36 month lease. 24 or 36 month leasing options available for qualified businesses.

Prices and specifications subject to change without notice.

TRW Customer Service Division. Free 90 day on-site service for 386/SX, 386/DX, 486/SX, 486/DX, and 486 EISA systems. On-site service for 286 systems available at extra cost. Free on-site is available to most locations in the contiguous United States.

Windows is a registered trademark of Microsoft Corporation. Pro Designer IIs is a registered trademark of Orchid Technologies. All other products or services are identified by the trademarks or servicemarks of their respective companies.

©1991 PC Brand, Bensenville, Illinois.

MasterCard, Visa, American Express, Discover, PC Brand Direct Advantage MasterCard, checks, money orders, direct wire and approved purchase orders accepted.

PC Brand, Inc., 877 Supreme Drive, Bensenville, IL. 60106, International Voice 1-708-860-2300, International Fax 1-708-616-2888.

PC BRAND™

THERE'S A BIG DIFFERENCE BETWEEN BUYING A PC AND BUYING PC BRAND.

1-800-PC BRAND TEL: 800-722-7263 FAX: 800-722-7392

Sales hours: Mon-Fri 7 AM to 7PM (CT) • Sat 8AM to 4PM (CT) Tech Support hours: Mon-Fri 8AM to 7PM (CT) • Sat 9AM to 2PM (CT)

PCM1891

For now, the Genesis drive needs to confront throughput scores that place it too close for comfort to the truly slow Chinon drive. This unit does not have much going for it when measured on performance alone.

Like most other drives reviewed here, the GenSTAR 2000 has full audio output capabilities and supports two channels. The proprietary interface uses DMA and has selectable address and interrupt settings. Though the unit shipped with Version 2.10 of the MSDEX software, Version 2.20 is included and available from Genesis. Installation of the drivers and extensions is thoroughly, clearly documented, although the company needed to send new replacement drivers during our testing of the unit. Initially, the drive consistently crashed on the 16K block size portion of our throughput tests whenever it was presented with a digitized video file. Once we installed the new drivers, the unit completed that portion of the tests without failure.

Service and support are handled directly by Genesis Integrated Systems and covered by its one-year limited warranty. Though the GenSTAR 2000 is aggressively priced and benefits from the added value of the bundled software, the trade-off is its poor raw throughput.

HITACHI HOME ELECTRONICS AMERICA

Hitachi CDR-1750S

by Greg Pastrick

The Hitachi CDR-1750S has a lot to like: good performance, a secure double-seal drive enclosure, automatic spin-down of the disk when unattended, a 64K buffer (a decent size to help maintain a consistent data-transfer rate), and standard CD-ROM data and audio capability. The CDR-1750S's \$1,135 price tag (\$965 without interface card) might be prohibitive, but the system's above-average performance and features provide some balance to the heavy pricing.

From installation to our performance tests, the CDR-1750S proved to be a smooth machine. It's quietly efficient, solidly built, and tightly wrapped. Like a few other drives in this review, the CDR-1750S is controlled by the Future Domain 8-bit TMC-845 SCSI interface, which has selectable address and interrupt settings. Audio functions on the unit support two-



Hitachi CDR-1750S

Hitachi Home Electronics America, Multimedia Systems, 401 W. Artesia Blvd., Compton, CA 90220; 800-369-0422, 213-537-8383.

List Price: \$965. Micro Channel interface card, \$170; Hitachi bus (PC equivalent), \$70; device drivers, \$30; Future Domain SCSI kit, with card, cable, driver, \$180; daisy-chain cable, \$100.

Requires: IBM-XT, AT, or compatible; DOS 3.1 or higher.

In Short: The Hitachi CDR-1750S drive is a quietly efficient, solidly built unit with good performance times on our tests. Its high price may place it out of the reach of most consumers.

CIRCLE 617 ON READER SERVICE CARD

channel operation and the system output jacks for both headphone and speakers. The unit also comes with a simple pop-up playback program that emulates the hardware controls of a common audio CD player on-screen.

The Hitachi 1700 line of CD drives includes the \$965 CDR-1700S, an MCA version of the same unit for \$1,035, and a Macintosh-compatible version of the 1750S for \$1,060. Aside from its non-SCSI proprietary interface, the 1700S has all the same functions and features as the PC-compatible 1750S.

SOLID PERFORMANCE

On our performance tests, the CDR-1750S ably matched the top machines of the test group. Of course, its Random and Sequential Throughput times are nowhere near as fast as the NEC CDR-73, but they compare favorably with the PLI CD-ROM Drive and Sony CDU-7211 desktop drives.

Hitachi provides service and support regionally with its East Coast, Midwest, and West Coast service centers. A standard one-year limited warranty covers the drive, interface card, and cabling.

What's remarkable about the CDR-1750S is that there's nothing too remarkable. Its price, while high, is not totally out of line with its competitors. The unit does not include advanced extensions or a bundled selection of CD titles. All you get

CD-ROM TITLES (CONTINUED)

PhoneDisc USA Residential, PhoneDisc USA Corp. (Marblehead, Massachusetts), \$995 (annual subscription per disk); \$1,895 for both disks.

Have the name but not the numbers? If somebody you're looking for lives anywhere in the U.S. and has a published phone number, chances are you will be able to find the person here. Available in two single-disk editions, Eastern and Western, this compilation of data includes almost 90 million names, addresses, and phone numbers. The annual subscription fee includes a half-year update. The search software is a breeze to use; you can limit your search by area code, ZIP code, street, city, and state, and you can dial or print the resulting number.

Other PhoneDisc USA products include *PhoneDisc California Plus* (\$995), which has an impressive address and telephone number reverse-indexing feature; *Info-direct*, Canadian residential and business listings (updated semiannually, \$4,000; updated monthly, \$8,000), and *Quick Ref Plus*, a less expensive collection of several hundred thousand of the most frequently called U.S. business and government numbers and association numbers (\$299). Letting your fingers do the typing may just replace letting your fingers do the walking, thanks to these powerful little disks.—Bruce Brown

Select Demos, Computer Library, (New York, New York), \$149.

If you know the right salespeople, getting a demo program of all the top software programs is easy. This CD-ROM disk is for people who do not have the time to sit through a sales pitch just to get a copy of a software demo.

More than 1,100 demo programs for DOS and Microsoft Windows software are packed onto this disk by Computer Library (an offspring of PC Magazine's parent company, Ziff Communications). Along with the working software, you get technical specifications and system requirements. All the programs can be copied to other disks.

Just about every major software publisher is represented (Borland, Lotus, Microsoft, and so on). There are even a few fully working programs, such as *GeoWorks Ensemble*, *Smartcom EZ*, and four of last year's top-selling tax preparation programs, including *TurboTax*.

—Gus Venditto ■

with the Hitachi CDR-1750S is a well-built machine with solid performance. For most purposes, that's all you need.

IBM CORP.

IBM PS/2 External CD-ROM Drive

by Wendy Dugas Pérez

Sometimes the IBM PS/2 product tree seems endless. As a branch on that tree, the IBM PS/2 External CD-ROM Drive reinforces the standard criticism of many other PS/2 product limbs: The performance and features do not justify the high price. The external unit sells for \$1,550, while the internal unit is priced at \$1,250—the highest prices of any drives in this review, even when you consider that IBM's street prices are considerably lower than the list prices. The drive package includes DOS and OS/2 drivers and the Microsoft CD-ROM extensions but no interface board or cables.

The IBM drive is similar in design to most other CD-ROM drives, with a slot in



IBM PS/2 External CD-ROM Drive
IBM Corp., 1133 Westchester Avenue, White Plains, NY 10604; 800-426-9292.
List Price: With SCSI adapter, \$1,550. SCSI card-to-option cable, \$220; SCSI option-to-option cables, \$90; internal unit, \$1,250.
Requires: Micro Channel PS/2, DOS 3.3 or higher.
In Short: This is an average performer at an above-average price. Unless you absolutely must have an IBM, better MCA options are available for less money.

CIRCLE 618 ON READER SERVICE CARD

the front that holds an industry-standard caddy. You can use the drive either externally or internally by installing it (minus the external case) in a half-height drive bay. Once you confirm that you have a

microchannel SCSI board (and terminator), installation is simple. You need only connect the drive to the power source and the interface card, make sure that your last SCSI device is terminated, and then run the installation program. This program automatically changes your AUTOEXEC.BAT and CONFIG.SYS files without giving you the option of editing them manually.

MEDIOCRE PERFORMER

Despite the fact that we tested it with a 32-bit IBM SCSI interface board, the PS/2 External CD-ROM Drive turned in only average performance numbers on our tests, placing it solidly in the middle of the pack. This drive, rated at 380 ms., uses any Micro Channel SCSI interface board. It comes with audio capabilities and two channels, a frequency response range of 20 Hz to 20,000 Hz, and a 75-dB dynamic range. In addition, the drive has a head-phone jack; an RCA jack is available on the external unit.

If you have an IBM shop, you will probably want to buy this drive. Otherwise, if you need a drive, you can get a better performer at a lower price.



The Jet.



Hewlett-Packard's latest little wonder is the LaserJet® IIIp printer. Delivering high-quality laser printing in an affordable, portable package.

**LASER MAGNETIC STORAGE
INTERNATIONAL CO.**

LMSI CM 231

by Greg Pastrick

Mixed impressions await the user of the LMSI CM 231. At \$783, it's certainly not the most expensive CD drive we tested, yet it's at the low end of the desktop CD-ROM product line from the Philips-owned Laser Magnetic Storage International Co. Though the drive worked without failing or crashing in the course of testing, its installation program has a small glitch that requires manual intervention for it to recognize that the Microsoft extensions file is present. And while the drive is compatible in every way with the formats and modes supported by standard CD-ROMs, it has a nonstandard plastic-sleeve disk caddy.

LMSI offers the CM 231 SCSI drive as one of two external drives in its product line. The other external drive is the CM 221, a serial device with a 500-millisecond average access rate, as opposed to the CM 231's 400-ms. rating. The company offers a pair of internal SCSI and serial

devices, the CM 204 and CM 214, as alternatives. Each has an average access rating of 350 ms. The company makes pricing simple: One price fits all, as does the standard two-year warranty. What's more, LMSI markets a 2-pound portable drive with data and audio capability for \$699, the CM 50. It too is a serial device that has an average access rating of 800 ms. A company representative calls this product "the consumer item" since it comes with a title-bundling option that includes *The New Grolier Electronic Encyclopedia*, a Philips music sampler, and the Dataware business yellow pages for an additional \$246.

FLAWLESS INSTALLATION

The CM 231 is controlled by the 8-bit Future Domain TMC-845 interface card, with jumper and switch-selectable addresses and interrupts. The company recommends that a SCSI terminator not be installed with the card. The unit's automatic installation utility loads the appropriate drivers and extensions and makes additions to the AUTOEXEC and CON-



LMSI CM 231

Laser Magnetic Storage International Co.,
4425 Arrows W. Dr., Colorado Springs, CO
80907; 800-777-5674.

List Price: \$783. PC host adapter and
software, \$150; PS/2 host adapter and
software, \$250; interface cable, \$50.

Requires: IBM-XT, AT, or compatible; DOS
3.0 and higher.

In Short: The appeal of the LMSI CM 231 is
mixed, at best. Although its Sequential
Throughput test scores place it among the
fastest drives we reviewed, its random access
performance places it with the slowest. A
nonstandard disk caddy and a slight bug in the
automatic installation program don't help.

CIRCLE 619 ON READER SERVICE CARD



The Engine.

Motorola microprocessors provide reliable 32-bit performance to LaserJet printers. At a cost that enables HP* to market them so competitively. From laser printers to camcorders, the world's most innovative products are powered by Motorola.



MOTOROLA

Microprocessor and Memory Technologies Group

CIRCLE 143 ON READER SERVICE CARD

reset manually with Version 2.20 of this software driver in order for the install program to recognize that it's there. An easier fix would be to recopy the MSCDEX file to the hard disk outside of the installation utility. Although such a procedure is unusual, it does not make the drive nonfunctional.

Similarly, the disk caddy is a bit unusual; it's certainly not the standard flip-top disk holder. According to LMSI, the sliding-plastic-sleeve disk holder that comes with its CM line of CD drives is meant to offer added protection for disks. Personal experience proves it a workable alternative, but you will need nimble fingers to open it, place and hold the disk in the plastic pincers without leaving greasy fingerprints, and slide the sleeve back without dropping the disk. The portable unit requires no caddy since it top-loads and reads High Sierra format 5.25- or 3.5-inch disks.

Testing the drive proved to be a somewhat disappointing experience. Its speed is consistent with the manufacturer's 400-millisecond average access rating. But its random and sequential throughput times together place the unit in the slightly slow-

CD-ROM DRIVES

er-than-desirable end of the performance range.

Based on its slow throughput test times, the CM 231 does not have the strong performance offered by other CD drives for nearly the same price. While the drive is not the most expensive one we reviewed, there are better performers for the money.

NEC TECHNOLOGIES INC.

NEC Intersect CDR-73

by Mitt Jones

The NEC Intersect CDR-73 provides the best evidence yet that not all CD-ROM drives are alike. This external drive, which lists at \$1,099 with a SCSI XT/AT adapter, far exceeded its own performance specifications on the PC Magazine Labs benchmark tests and outpaced even the fastest of its competitors. For those as concerned (or more concerned) with reliability

as speed, the CDR-73 also carries a generous two-year warranty.

As with past NEC models, you can purchase the \$949 CDR-73 and its internal counterpart—the \$849 CDR-83—alone or with an XT/AT SCSI adapter, a PS/2 SCSI adapter, or an interface kit for the Macintosh. Each adapter kit comes with the expected driver software, Trantor Systems' *Music Box* CD audio utility, and a pair of stereo earphones. The drive itself, which uses the usual Sony caddy, houses RCA jacks, a headphone jack, and a volume control.

Based on a drive mechanism of NEC's own design, the CDR-73 and CDR-83 both have an impressive access time rating of 300-ms., but their bigger advantage over their competitors lies in sustained throughput. Our CDR-73 evaluation unit consistently averaged over 220 kilobytes per second on each subset of sequential reads, a good bit above NEC Technologies' official 150-KBps rating.

NOT A MULTIMEDIA MASTER

Unfortunately, this drive was apparently not designed with multimedia in mind. Our informal tests of full-motion video ca-

Wow.

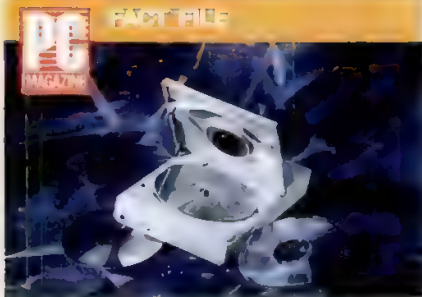


Great presentations are now as simple as pointing and clicking on icons. Because APPLAUSE II® automatically converts your data into any of 37 different chart types—including bar, line and pie charts. Word and organization charts are a snap too.

APPLAUSE II creates brilliant 35mm slides, overheads, hard copy or on-screen presentations. In black and white or your choice of up to 3.6 million colors. Eleven pre-designed color palettes make color coordination quick and easy.

Add impact to your charts and graphs with graduated backgrounds, scanned images, logos or clip art from the 700-piece library included with APPLAUSE II. Or create original graphics with its full-function drawing board.

*The demo requires either EGA or VGA card and monitor. APPLAUSE II, Ashton-Tate, and the Ashton-Tate logo are registered trademarks of Ashton-Tate Corporation. Other product names have been used for identification purposes only and may be trademarks of their respective companies. © 1991 Ashton-Tate Corporation. All rights reserved.



NEC Intersect CDR-73

NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 708-860-9500.

List Price: With disk caddy and interface cables, \$949; with SCSI interface, \$1,099; with Micro Channel interface, \$1,199. Internal version, \$849; with SCSI interface, \$999; with Micro Channel interface, \$1,099.

Requires: IBM-XT, AT, or compatible, DOS 3.3 or higher.

In Short: The fastest drive around, the NEC CDR-73 topped even its own performance specifications. Its one weakness may be its handling of multimedia.

CIRCLE 620 ON READER SERVICE CARD

CD-ROM DRIVES

dia disk paused frequently, apparently so the drive could refill its buffer. Results from a preliminary version of a transfer-rate test also showed that the drive had difficulty maintaining the faster requested transfer rates when working with small and intermediate block sizes.

Given that NEC Technologies holds one of the board positions of the MPC Marketing Council, one can safely assume that the company will introduce a multimedia-g geared, MPC-adherent drive in the not-too-distant future. The required firmware changes are relatively trivial; the drive mechanism itself clearly enjoys a significant advantage in speed.

Meanwhile, the NEC CDR-73 and CDR-83 stand as the fastest CD-ROM drives around for traditional CD-ROM applications—which still constitute the great majority of CD-ROM titles. The combination of speed and reliability makes this drive hard to resist, particularly if most of your applications are text-intensive. Don't overlook any future NEC offerings, whether or not your CD-ROM needs include multimedia.

PERIPHERAL LAND INC.

PLI CD-ROM Drive

by Ed Perratore

Take a Sony CD-ROM drive, put it in a large chassis, and you have the PLI CD-ROM Drive, a sturdy drive with a larger power supply than you will find elsewhere and a price that matches its size. The PLI CD-ROM Drive lists for more than the Sony CDU-7211—\$1,099 with the 8-bit Trantor T-128 board, \$999 with a slower XT/AT board—but gives similar performance.

An internal version of the same drive, OEMed from Sony's CDU-541, costs \$999 with the T-128 board and \$899 with the T-100 XT/AT board. The company also markets a chassis housing two half-height drives of any kind: two CD-ROM drives, or one CD-ROM drive and a hard disk, a tape backup drive, or any other drive Peripheral Land sells.

The PLI CD-ROM Drive we reviewed came with the T-128 board (the same board sold with the Texel DM-5021 and several other drives in this review), soft-

pability showed that the CDR-73 lacks the optimization required to maintain a smooth flow of data; for instance, video clips from the National Geographic Society's *Mammals: A Multimedia Encyclope-*

How.

How? With APPLAUSE II! By using its WYSIWYG "windows-like" interface, you can create spectacular presentation graphics by just pointing and clicking.

PC Magazine agrees: "APPLAUSE II has a fluidity and ease-of-use not found in either Harvard Graphics or Freelance Plus."

APPLAUSE II also creates electronic screenshows with professional transition effects. Which can be run on PCs that don't have APPLAUSE II installed. There's also a spell checker, LAN capability, and

much more.

For a free demo disk,* call 1-800-437-4329 ext. 1317. Or call 1-800-2ASHTON to upgrade to new version 1.5. Call today. Wow them tomorrow.



Ashton-Tate

NOBODY SAYS IT BETTER.

"Norton Utilities Version 6.0 provides impressive power and operating convenience with nearly bulletproof operation.... We can't suggest any way to make a package this powerful and full of features any easier to use."

*Tom Bigley
INFOWORLD
July 15, 1991*

"For those who want the best assurance that they can recover from accidental erasures and formats and keep a hard disk running at optimum performance, Norton is the safest choice."

*Peter H. Lewis
New York Times
Tuesday, June 18, 1991*

"The Norton package is the classic choice for serious troubleshooters and disk wizards...."

*Eric Grevstad
PC Computing
July, 1991*

NOBODY DOES IT BETTER.



"The Norton Utilities 6.0 gives serious power users everything they need in a DOS utility. It's clearly the only choice."

—Peter Norton

INTRODUCING THE NORTON UTILITIES™ 6.0.

For the ultimate in DOS® performance, nothing compares to the Norton Utilities 6.0. Because the Norton Utilities 6.0 provides the most sophisticated data recovery technology you can buy.

The Norton Disk Doctor®, UnErase®, UnFormat, and File Fix now work on larger disks and solve more disk errors automatically. UnErase even offers 100% recovery of network files using Erase Protect.

INFOWORLD Utilities Product Review*:

Norton Utilities 6.0	8.5
PC Tools 7.0	7.1

And according to PC Magazine, our "unique Disk Editor makes Norton the best single package for data recovery."[†]

What's more, the Norton Utilities 6.0 comes with NDOS—the ultimate DOS enhancement. NDOS combines the power of the command line with the flexibility of a DOS shell. It also reduces your DOS memory requirement up to 5K—yet adds over 200 powerful command line options. Including an extended batch language, longer file name descriptions, plus command line history, editing and audit trails. And of course, NDOS works with networks, Windows, and all versions of DOS.

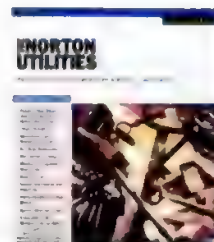
The Norton Utilities 6.0 even keeps your hard disk tuned for high performance. Speed Disk now defragments your disk four times faster than before. Plus the new Norton Cache—a Windows 3.0 compatible SMARTDrive replacement—delivers disk speeds unmatched by any other DOS or Windows utility. And Calibrate™ adjusts your

Power Features

- Takes full advantage of DOS 5.0
- NDOS—The Complete DOS Enhancement
 - File name descriptions up to 40 characters long
 - Faster, more powerful batch files
 - Command Line History, Editing and Audit Trails
 - Reduces the amount of memory required by DOS, yet adds over 200 command line options
- Speed Disk is four times faster than NU 5.0
- Faster Norton Cache for DOS and Windows
- Directory Prune and Graft on networks across drives
- Enhanced Directory Sort, Text Search File Attributes, File Date, File Size, and Line Print
- Full Screen and Quick Command Line Operation

interleave for even more speed and reliability.

So see your local dealer today and pick up a copy of the Norton Utilities 6.0. Or call **1-800-343-4714, Ext. 734P** for more information. It's the best way to achieve your highest system performance ever.



SYMANTEC.

CIRCLE 344 ON READER SERVICE CARD

© 1991 Symantec Corporation. All rights reserved. The Norton Utilities is a registered trademark of Symantec Corp. Other brand or product names mentioned are trademarks of their respective holders. *INFOWORLD, July 15, 1991; †PC Magazine, September 10, 1991.

ware driver, CD-ROM extensions, installation software, disk caddy, cable, and *Music Box*, an audio-control software program from Trantor Systems. The Trantor board uses software polling but allows you to change IRQs or DMAs when needed for a Novell or Xenix setting. You can also daisy-chain as many as seven units through one board, as per the SCSI specification.

MINOR DRAWBACKS

Like the Sony CD-541, the PLI CD-ROM drive lacks a power-on light. The drive's hum is barely discernible; you will never know the drive's on unless it's reading a disk. Keeping an eye on this drive should be easy, since you will have to keep it very close to your PC. The cable, the shortest around, measures a paltry 18 inches.

If the cable makes it to the back of your PC, you will find the Trantor-provided installation program straightforward and easy to use. It does the usual copying of the driver and extensions, and it makes the required additions to your CONFIG.SYS and AUTOEXEC.BAT files.

Where the drive performs well is speed. The PLI CD-ROM Drive ranked either a nose behind or a nose ahead of its Sony

PERIPHERALS CD-ROM DRIVES



PLI CD-ROM Drive

Peripheral Land Inc., 47421 Bayside Pkwy., Fremont, CA 94538; 800-288-8754, 415-657-2211.

List Price: With 8-bit Trantor T-128 SCSI interface board, MS-DOS CD-ROM extensions, driver software, cables, disk caddy, \$1,099; with XT/AT board, \$999. Internal version with T-128 board, \$999; with XT/AT board, \$899.

Requires: IBM-XT, AT, or compatible, 10K RAM, DOS 3.0 or later.

In Short: Good throughput, a rugged chassis, and ease of installation may not be enough to justify this Sony-made drive's high price. The stingy 1.5-foot cable also cuts down on your flexibility in positioning the drive.

CIRCLE 621 ON READER SERVICE CARD

equivalent, the CDU-7211, on nearly all sequential-access and random-access throughput tests. The drive exhibited no significant delays in regular use, perhaps because of its 64K buffer and the lack of interference from the Trantor board.

Discounted only to around the \$759-\$899 range, the PLI CD-ROM Drive is priced high for the corporate and educational sides of its intended market—although perhaps too low for the other side, government sales. This model has speed, ease of installation, and rugged construction. These benefits, however, may not justify the price.

PROCOM TECHNOLOGY INC.

Allegro Series, Model PXCD650S

by Ed Perratore

Sony is not the only suitor of the home PC enthusiast. Where Laser Library offers a hardware/software package for a \$699 list price and remarkable ease of use, Procom Technology has entered the home market with virtually the same drive, a similar software-bundling package and at \$479, a lower price. Unfortunately the product's poor throughput is not an asset.

The Allegro Series, Model PXCD650S posted some of the poorest throughput scores among the 15 CD-ROM drives in this roundup. The drive ranked ahead of only the lowly GenSTAR 2000 and Chinon CDX-431 in most of PC Labs' sequential throughput tests. In the random-access throughput tests it performed slightly better, but not far ahead of the slowest performers.

The Allegro PXCD650S also falls short of its chief competition when it comes to installation. The 8-bit proprietary board and Sony-made drive install easily, but you will find no installation program for copying the driver and CD-ROM extensions, or for modifying your startup files. The documentation—which includes an executable README file—does lead you through the procedure, but overall you've got a process that hardly competes with Laser Library's "type 'A:\LLINSTALL'".

If plodding disk access (even by CD-ROM standards) and manual installation don't faze you, you'll find some good things to appreciate in the Procom package. The bundle includes two small speakers that plug into the front-panel head-

D U M L A L C I H E
A V Z P M B K J D G
L O O K I N G W V I
O A F Z P C M X G E
F H E O A Y M O P Z
Z G K B R Y O Z I A
P I J U Z P T H O U
V O I A D O B E N X
D M J L I V O D T V
R A H O E A U X R N
F G E M O I K X Y P
W G U O A E I L Z Z
P V H O J X E N E C
E Z E I G H T X Y M

phone jack, and, depending on where you purchase the drive (bundling offers differ from dealer to dealer), a set of up to six library disks that may be all you need for general research. Our set was composed of the following *Software Toolworks* disks: *Illustrated Encyclopedia* (OEMed from Grolier), *Reference Library* (a collected dictionary, thesaurus, historical dictionary, and other reference works), *U.S. Atlas*, *World Atlas*, and the *PC-SIG* software guide. Another included disk (but not in time for our review) contains the text from a number of magazines.

PROCOM'S LINE

The Allegro PXCD650S is one of a few models sold by Procom. The internal version, the PICD650S, sells for \$80 less and uses an identical interface card and drivers. The high-end model, the external-only MCD-ROM, sells for \$895 (with no software bundling), and is intended primarily for the Macintosh market. By the time you read this, Procom also expects to offer a SCSI version of the Allegro PXCD650S. This internal or external model will sell at a price similar to the one we reviewed; it will also include bundled software aimed at the same general market.

An interesting distinction of the Allegro PXCD650S is its use of the PC's power rather than the product's own power supply and cord. The company claims that this design results in power more consistent with the PC's own, leaves less to go wrong with the unit, and lowers the drive's price. Most PC power supplies are of a sufficient



Allegro Series, Model PXCD650S

Procom Technology Inc., 200 McCormick, Costa Mesa, CA 92626; 800-800-8600, 714-549-9449.

List Price: With 8-bit interface board, cabling, driver software, MS-DOS CD-ROM extensions, 2 Sony speakers, up to 6 CD-ROM disks, disk caddy, \$479. Internal version, \$399.

Requires: IBM-XT, AT, or compatible, 512K RAM, DOS 3.0 or later.

In Short: Procom admirably competes on price with Sony as the latter makes a big foray into the home market. The manual installation, however, falls flat for the home user. Throughput is also particularly slow, even by CD-ROM standards.

CIRCLE 622 ON READER SERVICE CARD

CD-ROM DRIVES

wattage to handle the extra load of running the mechanical device, but make sure this is the case if your PC is packed with peripherals.

The CD-ROM disks bundled with the package and the product's \$479 price are clear advantages, but in installation and use, don't expect anything more than adagio from the Allegro PXCD650S.

SONY CORP. OF AMERICA

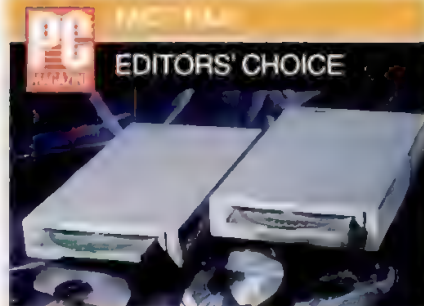
Sony CDU-7205

Sony CDU-7211

by Ed Perratore

As the chief pioneer of CD technology, Sony Corp. has seen its CD-ROM product line evolve to the company's current selection of two models, sold in both internal and external versions. Sony's latest target: the ripening market of home users.

The CDU-7205 (or CDU-535 for the \$649.95 internal version), the vendor's lat-



► Sony CDU-7205

Sony CDU-7211

Sony Corp. of America, Computer Peripherals Products Co., 655 River Oaks Parkway, San Jose, CA 95134; 800-222-0878, 408-432-0190.

List Price: **CDU-7205:** With 8-bit interface board, cabling, 6 CD-ROM disks, driver software, MS-DOS CD-ROM extensions, menu software shell, disk caddy, screwdriver, \$699. Internal version, \$649.95. **CDU-7211:** Drive alone, \$949. Interface kit with 8-bit SCSI board, driver software, MS-DOS CD-ROM extensions, cable, disk caddy: with AT bus, \$159.95; with Micro Channel PS/2, \$349.95.

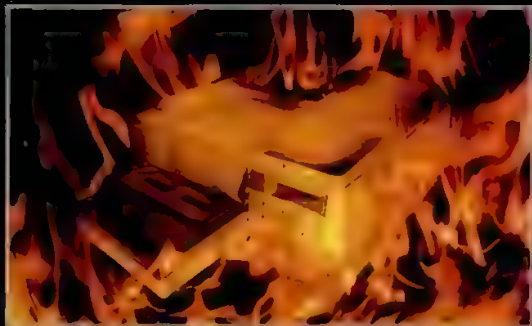
Requires: IBM-XT, AT, or compatible, DOS 3.1 or later, 512K RAM, hard disk. VGA graphics and mouse recommended.

In Short: Sony's latest offerings differ widely in their attraction to buyers. The CDU-7205, a six-disk package accurately aimed at the home user, is clearly a bargain. The CDU-7211 is pricier and far less competitive.

CIRCLE 623 ON READER SERVICE CARD

D	U	M	L	A	L	C	I	H	E
A	V	Z	P	M	B	K	J	D	G
L	O	O	K	I	N	G	W	V	I
O	A	F	Z	P	C	M	X	G	E
F	H	E	O	A	Y	M	O	P	Z
Z	G	K	B	R	Y	O	Z	I	A
P	I	J	U	Z	P	T	H	O	U
V	O	I	A	D	O	B	E	N	X
D	M	J	L	I	V	O	D	T	V
R	A	H	O	E	A	U	X	R	N
F	G	E	M	O	I	K	X	Y	P
W	G	U	O	A	E	I	L	Z	Z
P	V	H	O	J	X	E	N	E	C
E	Z	E	I	G	H	T	X	Y	M

LASERMASTER MAKES W



Smoking Fast Speed

Everyone knows that Windows makes it easier to *create* great documents—but that graphic sophistication can slow your printing.

The LaserMaster Professional delivers smoking-fast output for the *productivity* boost that dreams are made of. Multiple typefaces, headlines, scanned images, line art—LaserMaster's legendary print speeds produce complex pages *fast*. Whether you're on your first draft or your final masterpiece, you get 800 dpi business resolution in just a few blazing seconds.

Sizzling 800 dpi Resolution

Microsoft Windows has helped you improve the graphic impact of your documents. Now, don't let your ordinary 300 dpi laser printer hold you back.

LaserMaster's *revolutionary* edge can make your documents truly *sizzle*. A LaserMaster Professional controller gives you a *quality boost* to 800 dpi business resolution—all from the laser printer you already own. Our patented TurboRes technology gives you crisp, "jaggle-free" text and line art for all your important work.



Scanned pictures also look great. With 64 levels of grey at 91 lines per inch, you'll get newspaper-level image quality right on your desktop.

est, was at press time sold solely as part of the \$699 Sony Laser Library, a six-disk drive and proprietary interface board combination marketed toward the home user—particularly the novice with no interest in messing with switches and jumpers. The CDU-7211, whose internal CDU-541 version is a popular OEM model, performs about the same but has a whopping \$949 list price, plus \$159.95 for the AT-bus interface kit, or \$349.95 for the Micro Channel-bus kit.

LASER LIBRARY

Two of the biggest early obstacles to sales of CD-ROM drives (and subsequently software) have been price and ease of set-up. The Sony Laser Library not only lowers the price barrier but makes the technology palatable to new users as well.

The package includes the CDU-7205, a 2- by 7- by 13-inch (HWD) unit; an 8-bit board with a 40-pin proprietary interface; clip-on cabling; installation software and driver; MS-DOS CD-ROM extensions; six CD-ROM disks worth more than \$1,000; a disk caddy; headphones; and a collapsible screwdriver for installing the board. A



**Sony's Laser Library
not only lowers the
price barrier but makes
the technology
palatable to new users
as well.**

menu shell lets you select from among the disks: *Compton's Family Encyclopedia*; *Languages of the World*; *Mammals: A Multimedia Encyclopedia*; *Microsoft Bookshelf*; *Mixed-Up Mother Goose*; and *Software Toolworks World Atlas*.

The drive included is rated faster than its older sibling, the CDU-7211. Its access time is 340 ms., compared with the CDU-7211's 380 ms., but its buffer size is a

mere 8K, as opposed to 64K. The product's target market, however, will appreciate the virtually idiot-proof installation routine, which modifies your start-up files and copies the necessary files (up to 3MB; 11MB if you install the slick multimedia demo program) to your hard disk. Once the software is installed, you can remove the access files for whatever disks you like in order to restore hard disk space. You also can add other applications to the menu, whether they be other CD-ROM library disks or your own programs.

The installation instructions for the drive and board wisely relegate all mention of jumpers and switches to the back of the system user's guide. The Laser Library's Sony board, like that of the CDU-7211 and most other drives these days, uses software polling to avoid the slower IRQ and DMA routes. This means that most users will never need the technical section, and that you will not have to fuss with jumper settings unless you have a 286 or better PC configured to use the upper 384K of the first megabyte of RAM. But you will also have to go the IRQ/DMA route if you run the device under *NetWare* or Unix.

INDOWS PRINTING HOT!

135 Glowing Typefaces

Some days you get a burning desire to express yourself with typographic flair. Instead of using cumbersome font cartridges or slow-loading soft fonts, a LaserMaster Professional comes loaded with 135 premium typeface outlines, all instantly scalable to any size from 4 to 1200 point.

You'll get classic serif and sans serif faces for general use plus a variety of script and display faces for posters, invitations and other specialty jobs. And it's easy to add still more, because the LaserMaster Professional works with Type 1 fonts from any type foundry.

Get more speed, more resolution, and more fonts—all from the laser printer you already own.* Call today and get your free sample of LaserMaster's 800 dpi business resolution. But hurry, this one is HOT!

(612) 944-8693 Dept. 812

LM LASERMASTER™
TYPESETTING DIVISION

If You Hate to Wait!

*LaserMaster's Professional printer controller works with the HP Series II, HP LaserJet 3, and most other laser printers based on the Canon CX or SX engines.

© 1991 LaserMaster Corporation 6900 Shady Oak Road, Eden Prairie, MN 55344. The LM logo is a registered trademark and LaserMaster is a trademark of LaserMaster Corporation. Microsoft is a registered trademark and Microsoft Windows is a trademark of Microsoft Corp. Hewlett-Packard is a registered trademark of Hewlett-Packard Company. All other products names or brand names are trademarks or registered trademarks of their respective holders. Specifications subject to change. YES! All text was produced using an 800 dpi LaserMaster Professional Controller.

CIRCLE 237 ON READER SERVICE CARD

While you probably will not miss this 8K of upper memory, the board's driver also takes up 28K of conventional RAM, an amount destined to interfere with RAM-hungry applications.

SONY CDU-7211

The older CDU-7211 has an 8-bit SCSI interface board from Future Domain Corp.; in the Compaq Deskpro 386/25e we used in testing, both this board and two other Future Domain interfaces we had on hand took an inordinately long time (as long as 35 seconds) to recognize the SCSI ROM BIOS on the Future Domain boards. A Sony spokesman noted that this is not unusual. If this is not enough, the otherwise-helpful installation process inserts a "LASTDRIVE=Z" instead of the usually sufficient "LASTDRIVE=E" line into your CONFIG.SYS that hands over about 8K more to your environment than you need. (Each letter takes up about 400 bytes of environment space.)

Despite the slow boot, both Sony drives tested well. The two offerings finished in the top third in every sequential-access and random-access speed test. The CDU-7205



inched ahead of the older CDU-7211 in both random and sequential throughput, probably due in part to its faster mechanism. The PLI CD-ROM Drive—the same drive with a different board, a less RAM-hungry driver, and a price that clearly makes Sony's SCSI product less attractive—finished just ahead of the CDU-7211 on many throughput tests.

You cannot lose buying a Sony. With its novice-oriented approach and bargain software bundling, the Sony Laser Library represents the true power package of these two options—and an admirable choice.

TANDY CORP.

Tandy CDR-1000 CD-ROM Drive

by Wendy Dugas Pérez

If you're looking for an internal drive at a reasonable price, consider the Tandy CDR-1000. This \$399.95 half-height unit

will not dazzle you with its speed, but it will leave a few welcome extra dollars in your pocket.

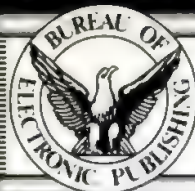
The drive uses an 8-bit proprietary interface board that comes with the package, along with the Microsoft CD-ROM exten-

The Tandy CDR-1000

**may not dazzle you
with its speed, but it
will leave you with a
few extra dollars in
your pocket.**

sions; when *Multimedia Extensions 1.0* for Windows ships, Tandy plans to sell a multimedia package which would include not only the drive, but *Multimedia Extensions* and an audio board as well.

CD-ROM



Microsoft
MPC
Multimedia PC

Microsoft Bookshelf

Bestselling CD-ROM disc ever! Only \$189

Microsoft Beethoven's 9th

Multimedia music masterpiece Only \$74

Monarch Notes on CD-ROM

Entire Collection 200+ Notes PC & Mac Only \$99

Greatest Books Ever Written

The Electronic Library 500+ Classics on CD-ROM \$295

Multimedia CD-ROM Titles

Mixed Up Mother Goose "Fun" educational disc \$59
Multimedia World Fact Book interactive business 2v \$149
Pioneer 6 Pack handbook & great discs \$39
U.S. History over 100 slides, books, & 100 images \$99
Countries of the World with maps, pictures, & sound \$99
Grollier's Encyclopedia 21 volumes 2 vcds & pictures \$99
Nat. Geographic / IBM Mammals pictures & text \$99
Compton's Multi-Media Encyclopedia \$99

MERIDIAN CD-NET
NETWORK CD'S ON PC'S FROM \$495 !!!

NEC CD-ROM BUNDLES!

GET A CD-ROM DRIVE KIT & PICK
ANY 5 OF 10 BESTSELLING DISCS!
ONLY \$697 SAVE UP TO \$1200 CALL!

COMPLETE - No additional Interface Kit charge

High Performance NEC CD-ROM Drive Kits

Multimedia capable - fast access times

NEC CDR-73 kit (external drive) \$199
NEC CDR-83 kit (internal drive) \$199
NEC CDR-36 kit (portable, battery available) \$299
NEC Disc Caddies (5 or more) \$99
Also Pioneer Minichanger, Canon, CDT, Denon, Hitachi, Todd
Sony CD-ROM products, WORM & Erasable drives in-stock - Call

CD-ROM Titles

Sherlock Holmes for 221 Baker Street fans \$19
CMC Value Pak-Birds, Shakespeare & Sherlock \$99
Magazine Rack 100's of periodicals \$99
CD Game Pack 4 great titles \$99
Between Heaven & Hell II \$99
World Atlas \$99
U.S. Atlas \$99
Microsoft Stat Pack business information \$99
Microsoft Small Business Consultant \$99
Voyage to the Planets astounding \$99
Coates Art Review \$99
Bible Library 9 bibles \$99
Family Doctor \$99
Library of the Future classic book \$99
Electronic Home Library Special \$99
TIME Magazine Compact Almanac \$99
Variety Video Directory \$99
Zip++ Every U.S. Address \$99
McGraw-Hill Ref. Set \$99
Microsoft Programmer's Library \$99
NEC DTP discs photos, fonts, clip art \$99
Select Demos \$99
Speed Dial \$99
Oxford Textbook of Medicine general \$99
PC-Sig Library new edition, version 9 \$99
Oxford English Dictionary \$99
Languages of the World \$99
PhoneDisc USA telephone directory, east & west \$99
* MORE! Over 300 different titles available
Money back guarantee Free tech support!

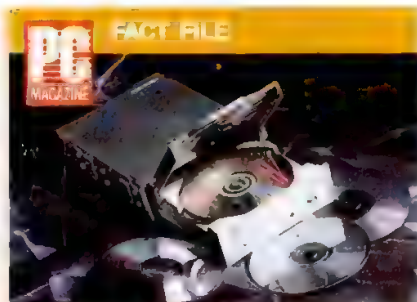
Bureau of Electronic Publishing, Inc.
Dept. B 141 New Road Parsippany, NJ 07054
FAX # 201-808-2676

CALL: **800-828-4766** ORDERS
201-808-2700 INFORMATION

CIRCLE 180 ON READER SERVICE CARD

HARDWARE

CD-ROM DRIVES



Tandy CDR-1000 CD-ROM Drive

Tandy Corp., 700 One Tandy Center, Fort Worth, TX 76102; 817-390-3300

List Price: With interface board and driver, \$399.95

Requires: IBM-XT, AT, or compatible, one expansion slot, DOS 3.0 or higher. Mouse recommended.

In Short: A familiar name and low price hardly make up for the exceedingly slow performance of this internal drive.

CIRCLE 624 ON READER SERVICE CARD

Setting up the hardware and software is extremely easy, although it requires several internal cable connections, which the manual explains and diagrams. Even with these connections, the installation time is shorter than with some external drives. When everything is connected, you run an installation program that gives you the option of changing your AUTOEXEC.BAT and CONFIG.SYS files, automatically or manually.

SLOW READ

The drive's 1000-ms. rated access-time landed it near the bottom of the pack on most of the PC Labs throughput tests. The CDR-1000 fared slightly better on the sequential throughput tests than on the random access tests, where its average was the lowest of any drive tested. Playing digitized video clips proved to be a particular problem for the drive, which paused frequently until we raised the buffers statement from its default of 2 to 20. Fortunately, this solution did not use up a significant amount of RAM.

Slow speed is the drive's biggest drawback. Unlike the other CD-ROM drives in this review, the CDR-1000 does not use a disk caddy. Instead, Tandy offers a flip-

top enclosure that makes disk switching cumbersome.

All Tandy products are backed by a one-year warranty through Radio Shack; this is no exception. If you are willing to trade speed for price, the CDR-1000 is worth a look.

TEXEL AMERICA INC.

Texel DM-5021

by Ed Perratore

Texel America has combined some of the better components on the market with others of their own design to put together a CD-ROM product line that delivers solid performance at a reasonable price.

The Texel DM-5021 uses a Sony read head with Texel's own motor. The \$529 package includes an 8-bit SCSI T-128 interface board from Trantor (the slower T-100 board is available for \$50 less), Trantor's installation software for the driver, MS-DOS CD-ROM extensions, a cable, and a Sony disk caddy.

Texel's 5000 product line includes four external drives, sold with and without audio (although the audio is mini-jack only, not RCA), and with or without rugged 700-ms. access-time lead-screw motors. A Macintosh-footprint model is also avail-

Texel America has taken some of the best components on the market, added others of its own design, and come up with a solid performer.

able. The 3000 line features internal versions of the 5000-line models, while the 7000 series comprises two portable drives with built-in SCSI interfaces and audio capability that plug into the parallel port of any PC.

Stop Living In The Past!

Unleash the potential of your PC by combining sound, animation and full-motion video — along with the encyclopedic storage of CD ROM — on your desktop!

Bundled With Over \$800 of Software FREE!



Is this your idea of computing? Endless monochrome screens filled with numbers and type and a flashing cursor. If your answer is yes, you're selling yourself short. Get more from your PC system and bring data to life with the power and excitement of multimedia. At the office, you can use your MPC to combine graphics, music,

animation — even live action television — to create attention-getting presentations and training materials. At home, you'll enjoy the way multimedia combines video clips with sound and educational information to make learning fun. And there are the games and entertainment packages with stunning graphics and sound. Multimedia's possibilities — at home, at the office or at school — are endless. And with the help of a CD ROM drive, you'll have worlds of information at your fingertips.

Build Your Own MPC

Our new line of Multimedia PC systems gives you full desktop multimedia capabilities at prices that will make you look twice. But you don't have to buy a completely new Multimedia PC system to put multimedia to work. Upgrade your present

286- or 386-powered PC with CompuAdd Multimedia Upgrade Kits and boards. The Multimedia Upgrade Kit includes the Multimedia Sound Board, the CD ROM drive and Microsoft Windows 3.0 plus Multimedia Extensions 1.0. Or you can install the TV/Video Board to display real time video in a resizable window on your monitor.

And CompuAdd's unique AM/FM Tuner Board plays AM and FM radio through your PC and includes infrared remote control that helps you manage your entire MPC.



Discover The Future With CompuAdd Multimedia.

An Explosion of Information

And CompuAdd MPC systems are the only MPCs that come with MacroMind Action, a revolutionary multimedia presentation package. You'll also receive Windows 3.0 plus Multimedia Extensions 1.0, Adobe Type Manager and five audio multimedia packages from Voyetra.

Call Today or Visit a CompuAdd Superstore Near You!

800-944-0061

CompuAdd®
Customer driven. by design.

CompuAdd's Multimedia Family:

MPC systems (complete with software, speakers and microphone)		
CompuAdd 316s MPC	66408	\$2595
CompuAdd 320SC MPC	66405	\$3195
CompuAdd 333 MPC	66406	\$4595
CompuAdd Multimedia Upgrade Kits		
Upgrade kit with internal CD ROM drive	79935	\$1069
Upgrade kit with external CD ROM drive	79936	\$1295
CompuAdd AM/FM Tuner Board with Infrared		
Remote Control (does not require Windows)	79932	\$299
CompuAdd TV/Video Board with Frame Grabber	79931	\$525

When you must carry your work out of the office, you owe it to yourself to carry the world's only real 9600 bps modem for portable use. The WorldPort 9600™ desktop modem makes business on the run, run a whole lot smoother, and a whopping four times faster than a 2400 bps.

Because it's from U.S. Robotics, it's not surprising that the WorldPort 9600 was designed without compromising features. In fact, as the world's first 9600 bps portable modem designed for real-world people on the go, the WorldPort 9600 offers some mighty impressive benefits.



THINK



Texel DM-5021

Texel America Inc., 1080C E. Duane Ave., Sunnyvale, CA 94086; 800-886-3935, 408-736-1374.

List Price: With 8-bit SCSI T-128 board, driver software, MS-DOS CD-ROM extensions, cable, disk caddy, \$529. With XT/AT interface card, \$479.

Requires: IBM-XT, AT, or compatible, 512K RAM, DOS 3.0 or later. Mouse recommended.

In Short: A Sony read-head coupled with a Texel-manufactured drive mechanism make for a product that falls in the middle of the pack regarding speed and ease of use. The price may make the purchase worthwhile; if not, Texel has plenty of other models to choose from.



DRIVE PARTICULARS

The DM-5021 lacks a power-on light, which can prove annoying. The 1.7- by 5.8- by 14.8-inch (HWD) chassis includes an eject button that, however tiny, is more responsive to the touch than the eject button of Sony-built models. The clips in the rear (for fastening the Centronics connector of our cable) were loose on our review model, however. This did not affect our testing, but it could prove troublesome in a cluttered office environment.

The DM-5021 failed to run away with any honors on the PC Labs performance tests for sequential-access and random-access throughput. (The PLI CD-ROM Drive, which uses the same board and driver, fared much better across the board.) It placed not far behind the two Sony models on the sequential-throughput tests—often scoring only a few hundred bytes per second behind—but in the random-access section the differences were much wider. The vendor's Japan-based parent company, Shinano Kenshi Co., makes motors for a variety of electronic

devices, but in this case the maker will have to do more to keep up with the likes of Toshiba and Sony.

The DM-5021 could be faster, but its test scores were close enough to the average that the product may never seem particularly slow during general use. Its attractions are common ones, but the price is low enough to make the DM-5021 worth considering for many users.

TODD ENTERPRISES INC.

Todd TCDR-6000

by Kellyn Betts

When it comes to CD-ROM drives, the best components do not necessarily make for the best products. Such is the case with the \$805 Todd TCDR-6000. Although the company bases this external drive on one of the best drive mechanisms in the industry, it does not team the Hitachi innards with an interface card that uses them to best advantage. And while the company packages the drive in a box with some in-

CIRCLE 625 ON READER SERVICE CARD

HARDWARE CD-ROM DRIVES



Todd TCDR-6000
Todd Enterprises Inc., 224-49 67th Ave.,
Bayside, NY 11364; 800-445-8633, 718-343-
1040 (in New York).
List Price: With proprietary interface card, \$605.
CDLink-8X interface kit, \$159.
Requires: IBM-XT, AT, or compatible, DOS 3.0
or higher.
In Short: A high price coupled with poor
performance makes this a drive to avoid.

teresting features, it fails to organize them with a cohesive manual.

The TCDR-6000 uses Todd's own proprietary interface card, the 8-bit TCD-IF8A, which seems to bog down the Hitachi-made drive. Its biggest problem is in sequential throughput, which is way below that of the MPC specification. It consistently finished near the bottom of the pack on our sequential throughput performance test, and did only slightly better on our random access test. When we played CD-ROM video, the drive choked, playing it far too slowly and jerkily.

DREADFUL DOCUMENTATION

The TCDR-6000 comes with network support and a feature that should be of interest to network users: a lock that prevents anyone without a key from accessing the CD within. Unfortunately, the documentation for implementing the drive on a network—and for the other features—is nearly nonexistent. A company spokesperson said that Todd does not provide its own documentation because using the products is intuitive. This is far from the truth.

Todd's TCDR-6000 is based on the Hitachi drive, one of the best drive mechanisms in the industry, but uses Todd's own proprietary interface card, which bogs down the drive.

In addition to the TCDR-6000, we tested the company's TCDR-6050 model, which comes with a SCSI interface card. Todd claims that its policy is to team the drive with the Trantor SCSI card most appropriate for the computer it will be used with. When the system failed to complete our random-access performance tests,

CIRCLE 626 ON READER SERVICE CARD

FAST



- An internal battery, permitting sophisticated features like MNP 2 through 5 error control and data compression, for throughput up to 19,200 bps. Think about it - the battery means never being tied to line-power again
- LEDs, and an internal speaker that take the guesswork out of call status
- Acoustic coupler capability for use in hotels, airports, even international locations without RJ11 connectivity
- CCITT and Bell compliance ranging from 9600 bps to 300 bps
- True portability, weighing in under 1/2 pound.

So when you carry your work with you, think fast. Think real fast. Don't settle for a toy. Carry the world's only real portable V.32 modem, the WorldPort 9600. Call 1(800)DIAL-USR, fast.

CIRCLE 231 ON READER SERVICE CARD

Robotics
The World's Leader in Data Communications

She's 5 years old.
She's already had
7 names,
16 identities and
21 homes.



Ad
Council

Every year thousands of children are kidnapped by their own parents. Beginning the tragic ordeal of life on the run. Child Find offers an end to the running. With our toll-free number and our mediation program, we offer a way out for the parents and for the kids.

For us, it's a labor of love. But unfortunately, we can't operate on love alone.

To find out how you can help, or if you need our help, please call 1-800-A-WAY-OUT. And help another child find a more peaceful future.



CHILD FIND OF AMERICA INC.

HARDWARE CD-ROM DRIVES

Trantor informed us that we'd been sent the wrong card. A mere page of documentation could have saved both of us the aggravation of trying to explain the problem.

In addition to the TCDR-6000 and TCDR-6050, Todd offers internal CD ROM drives and multidrive systems. In fact, the company says that it specializes in large systems where eight drives housed in a single case run off one card.

The company is probably worth investigating further if you have custom drive-cabinet needs, but the high price and poor performance results of its standard drives make them a bad investment.

TOSHIBA AMERICA INFORMATION SYSTEMS INC.

Toshiba TXM-3301-E1

by Kellyn Betts

Toshiba seems to have taken a cue from nature with its new \$799 TXM-3301-E1. They sealed their drive mechanism in an airtight compartment and metal case that protect it like a tortoise's shell, but have given it the speed of a hare.

The package will include *Multimedia Extensions 1.0* for Windows when it is available, but not an interface card or ca-

**Toshiba's sealed its
drive mechanism in an
airtight compartment
and metal case that
protect it like a
tortoise's shell, but
Toshiba has given it
the speed of a hare.**

bling. Bundled with the optional cabling and interface kit, which also includes Discovery Systems' advertising-oriented CD-ROM disk, the package lists for \$949. The drive and Future Domain TMC-845 SCSI interface are easy to install, thanks to a comprehensive manual that carefully details the procedure.

This new sealed drive, which replaces the company's 3200 line, represents Toshiba's fifth generation of CD-ROM drives. The XM-3301 family includes an internal model, the XM-3301B, and models for both PS/2 and Macintosh users.

A PROFESSIONAL EDGE

The TXM-3301-E1's high price pegs it for professional use rather than home use, and its high 25,000 MTBF rating makes it appropriate for intensive use in office environments. Additionally, the drive's high degree of protection makes it suitable for the industrial sector. In fact, the sealed chamber was developed in response to users in the automotive-repair industry who found that the harsh environment they work in was destroying drives with less armor.

This external drive performed well on our tests, with times that make it equally well-suited for audio, visual, hypermedia, and text-searching applications. It consistently placed among the top three drives in this review on all of the sequential-access and random-access tests.

For those who rank speed and durability as their top priorities, the TXM-3301-E1 is a suitable offering at a premium price.



Toshiba TXM-3301-E1

Toshiba America Information Systems Inc., 9740 Irvine Blvd., P.O. Box 19724, Irvine, CA 92713-9724; 714-583-3000.

List Price: With Windows multimedia extensions, \$799; with PCF interface kit, \$949; with PS/2 kit, \$1,099.

Requires: IBM-XT, AT, or compatible; 85K hard disk space, DOS 3.0 or higher.

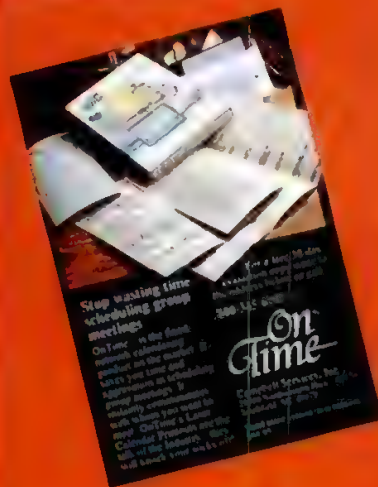
In Short: For speed and durability, the TXM-3301-E1 cannot be beat. All this ability comes at a steep price, though.

CIRCLE 627 ON READER SERVICE CARD

"Advertising in PREMIER is one of the smartest decisions we've made!"

"We've advertised in PREMIER since the very first issue, and it's one of the smartest decisions we've made. Our ad produces consistent results from Fortune 1000 companies. PC Magazine PREMIER puts us in front of the people who play key roles in purchase decision-making. Anyone who believes that time is money should take the time to check out PREMIER!"

Don Campbell
Campbell Services



PREMIER offers the power of full-color advertising in two crisp, attractive ad sizes. When you're ready to advertise to the largest group of PC buyers in the industry, you're ready for PC Magazine PREMIER.

It's here...

PREMIER

1-800-825-4237



Publisher's Paintbrush

Image Processing



Produce photographic quality black & white, gray scale, and 24 bit color images.

MORE THAN JUST A PAINT PROGRAM—Publisher's Paintbrush® brings the image processing tools of a professional photo lab into an easy to use Windows™ 3.0 application. Give your desktop publishing, business presentation, and graphic design projects stunning visual impact.

"Publisher's Paintbrush 2.0 may be the only graphics editor and paint tool you'll ever need."

PC World May 1991

Powerful image processing filters automate color correction and image enhancement. Use them to sharpen resolution, adjust brightness and contrast, blend, layer, and equalize scanned images. Add creative flair with 24 custom filters that include motion blur, embossing and texture effects. Multi-level

zooms let you move from precise retouching to editing larger than screen size images. Manipulate multiple images at the same time. Control your flatbed or hand scanner from within Publisher's Paintbrush. A unique prescan feature saves you time and memory. Precise closed loop scanner and printer calibration ensures realistic output. Extensive file format support includes PCX, TIF, GIF, TGA, BMP, EPS*, and more.

"If you've looked longingly at the Mac's bery of 24 bit color editors...your wait is over."

PC Magazine August 1991

True color image processing for Windows is shipping now. Available TODAY at your favorite software dealer. Call now for more information!

1-800-444-4780



© 1991 ZSoft Corporation

*EPS file support is write only. System Requirements: Microsoft Windows™ 3.0 or higher, Windows-capable computer with a hard disk, display adapter and drawing device. Publisher's Paintbrush is a registered trademark of ZSoft Corporation. Windows is a trademark of Microsoft Corporation.

ZSoft
CORPORATION
CIRCLE 175 ON READER SERVICE CARD

To update, send \$75 (add \$4.90 shipping/handling) and your original Publisher's Paintbrush program disk to: ZSoft Update, Dept. XE 450 Franklin Rd., Suite 100, Marietta, GA 30067. Specify 5.25" or 3.5" disk. GA residents add (3%) sales tax. Canadian customers add \$15.90 for air shipping. Outside N. America, add \$15.90 for surface shipping. \$24.90 via air. Payment in U.S. funds by check, money order, VISA, MC or AX. Upgrades from all ZSoft PAINT programs available, call for details. (404) 428-0008.

Artistry for All

ILLUSTRATION: JOEL SPECTOR



Whether you're a professional artist or a business user, a publisher or presenter, you will find plenty of utility in these four high-end drawing packages. Their drawing, text, and color capabilities are good for everything, from simple diagrams to beautifully rendered art images.

by Kellyn Betts

4 Illustration Packages

If Rembrandt could have hired an illustration software package as an apprentice, he would have been impressed. Not only could it complete its assigned tasks and revisions speedily, but its powers would have improved at an amazing rate over the span of a few years. Of course you don't have to be a Rembrandt (or even a Warhol) to appreciate the value of such tools. Though commercial-art professionals will find them indispensable for developing eye-catching compositions incorporating display type, text, drawings, and even scanned photographs, they are just as

useful to technical illustrators and even ordinary business people. Clearly, their utility is starting to be widely appreciated: Corel Systems Corp., for instance, reports 160,000 registered users of *CorelDRAW*—a far cry from the millions of word processor and spreadsheet users, but a pretty sizable presence for a type of software once considered a niche product for graphics professionals.

Like gifted students, PC-based illustration software packages have learned new tricks and refined their existing skills since the last time we reviewed them (see "Tools for the Talented: Five Illustration Packages," *PC Magazine*, September 11, 1990). All of them are solidly competitive on the basics of freehand drawing, but at the same time each has carved out its own area of specialty. *CorelDRAW*, for instance, is the master of type handling, and this has only been enhanced by the improved text transformation and conversion capabilities of Version 2.0. *Arts and Letters Graphics Editor* is notable for its large, integral library of clip art and symbols suitable for general business use, and Version 3.1 now supports color gradient fills on objects, making it easier to use blending effects. Version 2.0 of *Digital Research Artline*, with its layer and color managers, offers some nice capabilities, while Micrografx's *Designer*, with its multitude of special-purpose tools and its wealth of technical features, is still the technical illustrator's all-purpose drafting assistant.

Except for *Artline* (which is a DOS application that runs under Digital Research's *GEM* graphical environment), all these packages run under *Microsoft Windows*. Since our last review, they have been updated to run under *Windows 3.0*, and this has brought some significant improvements. Full support for *Windows 3.0*'s protected-mode memory management is a huge benefit for such memory-intensive applications; with access to more memory, you can create larger and more complex renderings. Extra memory also improves redraw speed and some other performance aspects. *Windows 3.0*'s enhanced color capabilities make it possible for these packages to use the full 256 colors of your Super VGA display, and will allow them to take advantage of even more screen colors displayed by the high-color and true-color graphics adapters that are just now becoming available at attractive prices.

We chose not to review a couple of

other illustration packages that don't measure up to our criteria for this category. *Adobe Illustrator* is one of the premier drawing programs for the Macintosh, but its PC version is far weaker than its Macintosh sibling; it has not been upgraded in years, and it can't even



**An illustration package
is an electronic
drawing board.
Instead of working
with pens and pencils,
you work with shapes.**

show color on-screen. *MASS-11 Draw* from Microsystems Engineering Corp. (Hoffman Estates, Illinois) lacks the font capabilities and support for color gradient fills needed to perform the full range of tasks expected of the packages in our review; it is primarily useful for simple technical illustration, especially on low-end machines.

DISTINCTIVE FACES

An illustration package is an electronic analogy to the drawing board used by flesh-and-blood renderers. But instead of working with pens, pencils, knives, and other physical tools, you work with shapes, building up images out of straight lines, curves, circles, squares, polygons, and other so-called graphics primitives. Because these primitives are defined mathematically (as vectors) rather than as collections of points (like a scanned photograph), they can be rescaled, resized, and transformed infinitely without loss of detail or quality. When printed, they appear at the full resolution of which the output device is capable.

All the packages in our review are pretty much the same in their basic design: They have a blank page on-screen and tools in a toolbox window on the side. But they differ in style of implementation. Micrografx's *Designer*, for instance, has a multilayered design similar to a CAD program, with a separate tool icon for the precise placement of just about any shape

you might want to create—including such esoterica as parabolas. This makes it a powerful and productive tool for those versed in its ways, but others will find it difficult to learn. By contrast, *CorelDRAW*'s power bears a simpler, cleaner face. It has just a few tools, but with a few logical and easily grasped tricks, these can be made to do double or triple duty. *Artline* takes the "user's choice" approach: Though it comes with a few powerful, multipurpose tools by default, its customizable toolbox lets you create your own tools, which can be specific curve settings, customized palettes of colors or fills, or even autotracing settings.

Once you have created your basic geometric entities, you can enrich their appearance by applying effects and attributes. You can change the widths, types, and ends of lines, for instance, or fill areas with colors, patterns, or gradients to create shaded effects. And the power of computer graphics can create complex effects with little effort. It is easy, for instance, to skew, flip, and mirror polygons to serve as perspective elements in a three-dimensional scene. *Artline*, *Arts and Letters*, and *CorelDRAW* offer powerful interpolation or "tweening" functions, which not only let you create complex blends that transform in shape as well as color, but also let you create interesting animated or patterned effects out of simple shapes.

BRAVURA TALENTS

The latest versions of *Arts and Letters* and *CorelDRAW* let you create dramatic perspective or warping effects on either drawings or text while retaining the text or images' underlying integrity as editable objects. For example, you could easily use *CorelDRAW*'s special effects to fit the images of a sunbather and a skier inside the lenses of a pair of sunglasses, or to create three-dimensional letters for your designs. (With sufficient skill, these things can be done using conventional tools, but only laboriously and you could not edit the text or drawings once they were transformed.) Such automation is a time-saver to the professional and lets the otherwise artistically unskilled create some impressive effects.

All these transformations can easily be applied to type as well as to drawings. All these packages offer an impressive array of scalable typefaces to play with, and all let you convert letters to curves for ma-



©1991 Universal Press Syndicate

Now you're just a click away from The Far Side.

Introducing The Far Side Computer Calendar. For the first time on computer, Far Side characters come alive. This software has a day-organizer calendar featuring four views. Day. Week. Month. Year. Plus, a whole bunch of animated characters and creatures make random guest appearances on your screen to lighten up your day. Visit your local dealer or call 1-800-367-4802.

amaze!nc™

©1991 Amaze, Inc., All Rights Reserved
CIRCLE 199 ON READER SERVICE CARD



ILLUSTRATION SOFTWARE: SUITABILITY TO TASK

Illustration software is a competitive category, and the four packages we review here are strong in the basics. Your choice will depend on their strengths in particular areas; graphic artists will appreciate *CorelDRAW* and *Arts and Letters Graphics Editor*, while technical illustrators will find *Designer* better suited to their needs.

THE TASKS

Basic Illustration rates the strength and breadth of the product's basic kit in terms of drawing, editing, and workspace management tools, plus special effects and fills (such as skewing or gradient fills) that can be applied when drawing objects.



Type handling rates the strength of the program's type-handling features. Considerations include the flexibility of the program's text-alignment options, its control over type specifications such as leading and kerning, the number of font choices it offers, and its ability to create special text effects.



Technical Illustration rates the package's suitability for precision illustration tasks. The ability to assign exact numeric measurements to elements, the flexibility of the program's rulers, grids, and snap options, and the quality of layering are primary criteria. We also take into account its features for importing CAD drawings (such as the ability to handle dimensioning, create elements lists, and import .DXF files).



Color publishing rates the program's suitability for producing printed color output of your illustrations. Considerations include the strength of its basic color models, its color PostScript support, and its ability to handle such printing-related tasks as registration marks, spot- and four-color separations, batch printing, and undercolor removal.

Color presentations rates the program's suitability for generating highly designed color slide shows. Considerations include the strength of paragraph facilities (for creating bullet charts and text tables), the richness of color options and special effects, the quality and range of included clip art, and the strength of graphics and text-file import and export filters. We also take into account the product's ability to create simple business graphs and screen shows and its support for slide services and desktop film recorders.



SUITABILITY TO TASK

Product Name	Basic Illustration	Technical Illustration	Type handling	Color publishing	Color presentations
CorelDRAW	4	3	2	1	N/A
Arts and Letters Graphics Editor	4	3	2	1	N/A
Designer	4	3	2	1	N/A
DrawPlus	4	3	2	1	N/A

Note: The sum of the scores should not be used for comparison and is not a factor in determining Editors' Choice

Product Name	Basic Illustration	Technical Illustration	Type handling	Color publishing	Color presentations
CorelDRAW	4	3	2	1	N/A
Arts and Letters Graphics Editor	4	3	2	1	N/A
Designer	4	3	2	1	N/A
DrawPlus	4	3	2	1	N/A

THE RATINGS

4—Excellent

3—Good

2—Fair

1—Poor

N/A—Not applicable

nipulation as objects. You can accomplish many effects (notably, fitting text along a curved path or masking it over a pattern in a cookie-cutter fashion) while retaining the text in an editable form. Masking functions make it easy to dress up your type and images with things such as imported patterns and color bitmaps of scanned images. *CorelDRAW*, through its WFNBOSS utility, even lets you import and export fonts in standard scalable formats such as Adobe Type 1, though it does not support hinting and other niceties.

These illustration packages are likewise favored with excellent color support. Thanks to *Windows 3.0*, all but *Artline* support a full 24-bit color model with 16.7 million colors both on-screen and in printed output (*Artline* supports up to 1 billion colors, but only in printed output). All packages fully support color PostScript output and export to EPS format for inclusion in published documents. All have the ability to handle both spot and color separations using CMYK color models, as well as assigning colors from Pantone palettes—though professionals will want to scrutinize the products' technical differences and limitations closely.

FOR THE ARTIST IN ALL

While their appeal to artists is apparent, these packages have plenty of appeal for less innately talented users. Certainly, such a range of powerful features allows "the rest of us" to create things we could never dream of producing with a pen and paper. There are a lot of bread-and-butter business uses for an illustration package—from quickly putting together diagrams for presentations and reports to editing and recoloring clip art. All of the packages in our review come with substantial collections of clip art, and all can import files in CGM and EPS formats—the two most widely supported formats for third-party images. (See "Clip Art," *PC Magazine*, May 14, 1991.) You can also incorporate scanned images or other bitmapped artwork into your drawings (in .PCX or TIFF format), and through autotracing these can even be transformed into editable vector drawings.

If your needs are simple, you may be tempted by the simplicity of less expensive drawing packages such as *DrawPlus* from Micrografx or *Ventana-Draw* from VentanaWorks (Tempe, Arizona). Some business graphics packages, notably Micrografx's *Charisma* and WordPerfect Corp.'s *DrawPerfect*, also offer good

drawing tools. Be aware, however, that their limits will start to pinch if you have much ambition in that area. Typically, these lower-end tools are fine for creating charts with simple shapes and lines, and they are even good at sketching and shaping freehand curves when you use a mouse. But their drawing skills vary widely, and none of them offer the full range of text, color, and curve-shaping facilities that their big brothers support as a matter of course. Few can import editable EPS files, and this restricts your ability to use third-party clip art.

In many ways, an illustration program makes the best possible companion to your presentation graphics package, whether you're a business user or a pro-



fessional graphic artist. Presentation programs shine at what they were designed to do, which is to create word and data charts with a consistent look. (See "Presenta-

tion Graphics," *PC Magazine*, May 14, 1991.) Adding an illustration program to your toolset lets you create sophisticated tables and diagrams; break apart, recombine, and reshape clip-art symbols with complete freedom; and add special text, line, and color effects. You can easily import the images you create into your presentations simply by importing them as graphics files.

For professional users, versatility and power have helped make these packages the tools of choice for creating highly designed 35-millimeter slide shows; they are beginning to supplant the expensive custom-designed systems professionals once used for these purposes. All can output directly to at least some film re-



EDITORS' CHOICE

- **CorelDRAW**
- **Designer**

Illustration software is one of those rare categories in which all the products are worth your consideration. Our previous Editors' Choices, *CorelDRAW* and *Designer*, however, still have enough of an edge to gain our recommendation.

CorelDRAW, from Corel Systems Corp., maintains the general-purpose flair that makes it the best choice for most users. The program's exceptional strength in type handling, which is enhanced in the current version, will make it the favorite of a wide range of commercial graphic artists as well. Version 2.0 supplements the basics with a rich set of special effects, such as enveloping and extrusion.

The program could still use some improvements (notably the ability to lock items in place), and a few of its hot new features are betrayed by implementation problems. Printing can be slow on complex drawings, and it's all too easy to generate images that are too complex for your PostScript interpreter to print. Bugs in the WFNBOSS font-conversion utility at the time of our testing made the new Type 1 export capability almost useless. These are unfortunate and uncharacteristic lapses in an otherwise superb product, and the company is planning to fix these in an upcoming maintenance release.

PRECISION AND STRENGTH

In contrast to *CorelDRAW*'s flashy new features, Micrografx takes a quieter approach with *Designer* by honing its distinctive strengths rather than breaking new ground. As always, *Designer* presents a daunting face to the new user, with its plethora of tools and its layer manager, customizable toolbox, and precision measurements. The package requires a significant commitment to learn, but for those who need the precision and power *Designer* offers, the results are well worth the extra time and effort.

The most important enhancement in Version 3.1 is a thorough performance tuning, which affords a dramatic improvement in usability. Version 3.1 also fills in some competitive gaps; particularly welcome is its newfound ability to import *Adobe Illustrator*-format EPS files and to fit editable text to a curve. *Designer* is still the power user's choice.

The other two products, while good, are not our top choices. *Arts and Letters Graphics Editor*, with its unique symbol-based interface and large clip-art library, is the most improved. It has a number of unique features: multipart gradient fills that give you interesting effects without memory-hogging blends; a small

but useful set of special effects, including a warp function similar to *CorelDRAW*'s enveloping and even a tiny charting module. Yet the program's slow display of large text blocks is a real nuisance, and its arbitrary limitation on the number of objects in a drawing seems indefensible in a product designed for *Windows 3.0*. Moreover, it still does not offer a decent autotracing function.

Digital Research Artline is something of a specialty choice, a full-fledged illustration package for the non-*Windows* user. Version 2.0 is much more competitive than Version 1.0, and its distinctive features (a well-designed layer manager, a customizable toolbox that includes 21 icons for commonly used tools, and the ability to save gradient fills on palettes) give it a few competitive twists. Yet its status as a DOS package is a curse as well as a competitive distinction: Though it runs on low-end machines, *Artline*'s inability to access extended memory directly in protected mode seems to hurt its performance in terms of managing complex drawings. And unlike the *Windows* packages, *Artline* does not offer routine support for 256-color screen drivers; its excellent color capabilities are visible only in grainy dithered form. ■

corders, and all support color PostScript, a format increasingly favored by service bureaus for slide imaging. Some of these packages even have a few features that are specifically useful for presentations: *Artline*'s layer function, for instance, makes it relatively easy to generate progressive build slides, word charts in which each successive point is highlighted in a different color. *Designer* has fairly sophisticated screen-show capabilities, including transition effects that make it particularly useful for creating custom presentations.

OF TASTE AND TALENTS

Technical illustrators and architects have their own special needs, and some of the packages in our review have done special things to accommodate them. Since most technical diagrams come from CAD systems, a product has to be able to import .DXF files. Fine control over line weights and styles, a good selection of arrowheads, and the ability to create and import standard symbols are also imperative.

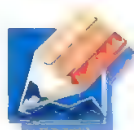
Though *Artline* is acceptable at this task, *Designer* is clearly the strongest of the four as a technical illustration tool. This is no accident; the company claims that 70 percent of its user base is technically oriented. Like a CAD program, it is built on a layered system with multiple tools, so it will be familiar to those who have learned this style of working. It supports associative dimensioning, can rotate objects in 0.1-degree increments, and lets you assign symbol IDs, which greatly simplifies the production of parts lists. *PageMaker* 4.0's newfound ability to import *Designer*'s proprietary .DRW files directly closes the loop in the production of documents. *Designer*'s latest version (3.1) fixes its most conspicuous weakness—unreliable .DXF file import filters—and vastly improves its performance.

All of these products are very competitive in their basic drawing capabilities. Business users will probably prefer the *Arts and Letters* symbol-based interface or *CorelDRAW*'s clean slate to the complexities of *Designer*. And Windows-phobes will be drawn to *Artline*. In the end, though, the package you choose is as much a matter of personal taste and preference as of nuts-and-bolts feature comparison. Each package has its own partisans; it's worth trying out the packages you think you want before you make a purchase. Read on for portraits of the artists.

COMPUTER SUPPORT CORP.

Arts and Letters Graphics Editor, Version 3.1

by Luisa Simone



Arts and Letters Graphics Editor's reliance on clip art is apparent from the moment you load it. Except for line and curve tools, everything in Version 3.1 of this \$695 program (even graphics primitives such as circles and squares) must be treated as clip-art symbols, and you must import them by typing in the appropriate ID numbers from a catalog booklet. Though this approach is unusual, it has the advantage of letting novices quickly assemble complex pictures from the bundled clip-art library of over 5,000 images.

Once you've got the symbols you want on-screen, *Arts and Letters* becomes more conventional. Its toolbox contains rotation, duplication, and skewing functions that you can use to customize your clip-art objects, and there is even a unique menu item (Align Logical) that automatically reassembles a clip-art image so that all its constituent elements make sense in relation to one another. You can employ other toolbox functions (such as node editing) and many of the special effects on the Manipulate menu (such as clipping, merging, and blending) only after you convert the symbols to free-form objects, however.

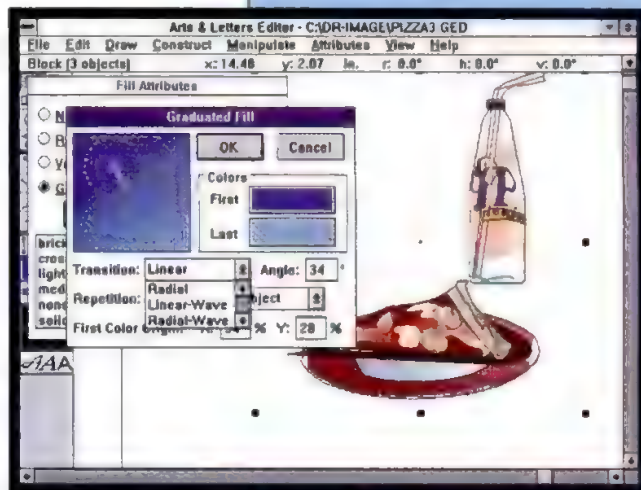
Many of *Arts and Letters*' functions are idiosyncratic in design. For instance, you cannot undo a rotation, and you must break apart the elements of merged or clipped objects before changing their outlines. You can edit an object only if it has been previously selected; to edit another shape, you must tediously exit the free-form editing mode and then use the selection tool to pick a new object.

Still, there's no denying the inherent

power of these tools. *Arts and Letters*' masking functions—something not available with *CorelDRAW*—made cleaning up the rough edges of the test illustration a one-step operation. The ability to turn on constraints that maintain smooth curve joins increase the efficiency of your curve editing. Those users creating complex illustrations will appreciate the functions that name, lock, and hide objects, which serve as good substitutes for true layers. And technical illustrators can use its options to specify, save, and recall numeric parameters of objects to describe line lengths precisely, position elements, and duplicate angles.

BLENDS AND GRADIENTS

Arts and Letters' warp function (which is similar to *CorelDRAW*'s enveloping features) is new to Version 3.1. It lets you apply perspective and distortion effects to simple outlines, grouped objects, clip-art symbols, or text. Like *CorelDRAW*, *Arts and Letters* lets you edit the shape of an object's bounding box and constrain the editing process by using different levels of symmetry, but it does not have *CorelDRAW*'s unique ability to simulate 3-D extrusions. It does come with nine preset shapes (a bell and a roller coaster, for example), and it can compress or expand the special effects logarithmically—just the sort of special tweaking that can help an inexperienced artist cre-



Arts and Letters Graphics Editor, Version 3.1, has added sophisticated gradient fills as a pattern option. Besides picking starting and ending colors, you can set the starting point and angle for the transition interactively.

See the Difference.

"Using each adapter at VGA, 800-by-600 and 1,024-by-768 pixel resolutions, all test images were displayed crisply."

-- PC Week

"The image is the brightest we've ever seen, even in the brightly-sunlit new CADalyst office."

-- CADalyst

"The intelligence built into this monitor eliminates all of the arm stretching and wheel turning so often associated with video mode changes."

-- PC Magazine

"Nanao thoughtfully places the seven most-used controls on the front of the monitor, unobtrusively tucked below the faceplate."

-- Macworld



See the difference that the industry experts agree has set the **Nanao Flexscan 9080i** apart from other monitors.

The Difference Will Impress You.

Color yourself impressed by the Nanao Flexscan 9080i's multiscanning abilities and high resolution. The 1280 x 1024 non-interlaced resolution increases productivity and enhances graphics applications beyond compare. Its high refresh rate (74Hz) is easy on the eyes. And with sharper text and brighter colors, the 9080i delivers the high quality professionals need...and want!

The Difference Will Excite You.

Get excited about doing what you've always wanted to do with Windows on the 9080i's larger 16-inch screen area. Highly compatible, in compliance with the Video Electronics Standards Association. Convergence & pin-cushioning controls. Dual inputs for two computers or two boards. The little differences that make for an exciting new monitor.



The Difference Will Comfort You.

Sometimes for high performance you need to give up creature comforts. But not with the 9080i. Sit back and relax in front of your Nanao monitor and its convenient front control panel. Almost every adjustment is within your reach. Nanao Flexscan monitors even align themselves with the Swedish MPR standards of low radiation emissions and give you an anti-static coating, fulfilling your ergonomic needs.

See the family of monitors ready for the next step in high resolution. To see the difference for yourself, contact your local Nanao dealer or call us at **1-800-800-5202**.

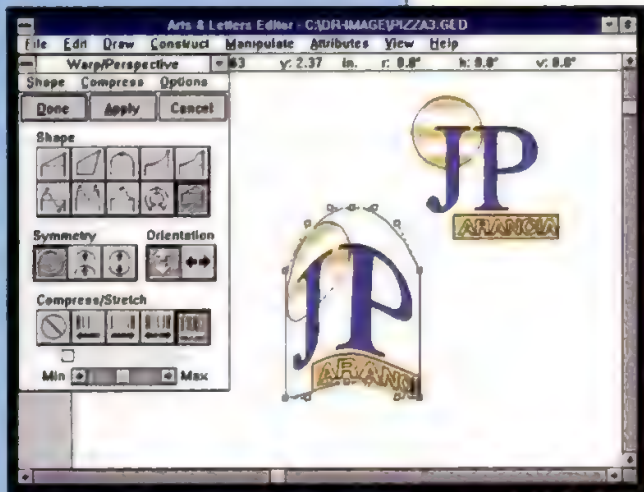
NANAO®

NANAO U.S.A. CORPORATION

23535 Telo Avenue
Torrance, California 90505
(213) 325-5202

CIRCLE 283 ON READER SERVICE CARD

"Cutting Edge" images created by Joe Lorenzini/Valerie Bernescut. Huntington Beach. "Living Room" image created by Neolux. Pasadena. NANAO and FLEXSCAN are registered trademarks of Nanao U.S.A. Corporation.



New to Version 3.1 of *Arts and Letters* is a warp/perspective feature, which lets you apply perspective and distortion effects to simple outlines, grouped objects, clip-art symbols, and text.

ate realistic effects. In our test illustration, for example, compressing the label at either end enhanced the illusion that it was wrapped around the bottle.

Arts and Letters' blend tool, which lets you create smooth gradations in color and in shape, is still one of its most useful features. This tool is excellent for creating naturalistic highlights on irregularly shaped objects and for tweening one shape into another. But because blending creates large numbers of intermediary objects, it is a memory hog. Fortunately, you no longer have to use a blend when a simple gradient fill will do; Version 3.1 includes sophisticated gradient fills as a pattern option. In addition to picking starting and ending colors, you can also set the starting point and angle for the transition interactively. You can employ sinusoidal waves that use a shorter transition range for more-dramatic color shifts, in addition to normal linear or radial fills. You can even indicate how many times a gradient should cycle through the two colors, an option that lets you apply impressive surface effects.

Arts and Letters comes with 52 proprietary scalable typefaces, and you can create plenty of special text effects using its various controls. Version 3.1 can read Type 1 font metric files directly and can convert them to curves; it also supports *Adobe Type Manager*, which puts an

almost limitless number of Type 1 fonts at your disposal. Those who use type in large blocks, however, will be disappointed. Though the program imported our text file without a hitch (you can use up to 5,000 characters per text object), its lack of margin controls, its inability to kern letter pairs interac-

tively, and its limit of only one font per text block make it less than fully suitable for text work.

The program is still weak when it comes to tracing. You still must click on each individual outline that you want to trace. Though the tracing tool was able to reproduce the small lowercase letters in our test logo once we found the right parameters, the long swooping path around the initial caps (*J* and *P*) proved to be untraceable at 300 dots per inch. Rescanning at a lower resolution solved the problem; it turns out that *Arts and Letters* has a limit on the number of points it can keep in memory during tracing. This is a far cry from the sophisticated autotracing available in competitors.

BONUS POINTS

Arts and Letters is the only program in this roundup to include a charting module, and you can even use it to create rudimentary pictograms from clip-art symbols. The convenience of built-in charting is unbeatable, but be warned: Its limited data set (5 columns by 12 rows), its inability to import .WK1 or *Microsoft Excel* files, and its sparse formatting commands limit its utility to only the simplest graphs.

A far more useful extra is the *Decipher* file-conversion utility, a customized version of Computer Presentations' *Image-Prep* graphics utility. This not only converts Targa, .GIF, and .PCX files to the 8- or 24-bit TIFF format that *Arts and Letters* imports directly, but it also lets you correct and optimize their color or convert them to gray scales. Computer Support Corp. has customized *Decipher* by adding a full-blown PostScript interpreter, so unlike other drawing programs that can read

only *Adobe Illustrator*-format PostScript files (a tightly controlled subset of the entire page-description language), *Decipher* lets you convert any PostScript file to *Arts and Letters*' proprietary .GED format. This is a really significant benefit for professional users.

INNOVATIVE TECHNOLOGY

Arts and Letters' habit of providing cutting-edge tools often cuts both ways. The new gradient fills, for example, print faster and with better gradations on true PostScript printers, but printing to a PostScript clone (Princeton PS-388 Accelerator) or to an HP LaserJet yields less than satisfactory results. The awkward transitions between colors show that *Arts and Letters*' rasterization routines need improvement.

Arts and Letters supports its own brand of multitasking, which lets you select and manipulate objects while other portions of the screen redraw. This advanced functionality does not compensate, however, for the program's incredibly slow display times when working with large text blocks. Moving complex objects during a redraw often results in screen artifacts that can be erased only by forcing a complete refresh of the image. Though Version 3.1 fully supports *Windows 3.0*'s memory management, the program still has a hard-



Arts and Letters Graphics Editor, Version 3.1

Computer Support Corp., 15926 Midway Rd., Dallas, TX 75244; 214-661-8960.
List Price: \$695.

Requires: 286-based PC or better (386-based PC or better recommended); 1MB RAM; 10MB hard disk space; EGA, VGA, or SVGA graphics adapter; DOS 3.1 or later; *Microsoft Windows 3.0*; mouse.

In Short: This drawing package and clip-art library contains some dynamite features that both novice and professional illustrators will find helpful. But be warned: The program's idiosyncratic interface makes for an erratic learning curve, and it is still limited in the number of objects it can hold in memory at once.

CIRCLE 001 ON READER SERVICE CARD

GRAPHICS ILLUSTRATION SOFTWARE



wired limit of 1,245 objects per drawing. In our test illustration (admittedly highly memory-intensive because of several warped objects), this limitation required that we compose the tablecloth of fewer and larger checks to save memory.

Though its idiosyncratic interface and performance limitations are a hindrance, an extensive clip-art library and versatile special effects make *Arts and Letters*, Version 3.1, one of the better illustration packages for novices. Professionals as well will be hard put to resist some of the program's finely honed tools. Provided you share this product's ethos, it has more than enough power to realize your aesthetic.

COREL SYSTEMS CORP.

CorelDRAW, Version 2.0

by Paul Murphy



A disciplined artist learns to create within the limitations of his or her chosen media, but few media can be more

limiting than a PC. For that reason alone, *CorelDRAW*, Version 2.0, is the answer to the electronic artist's yearnings, whatever his or her level of skill. This \$695 *Microsoft Windows*-based illustration package, which contains such a wide array of tools and well-implemented functions that even Macintosh-based professionals will be left drooling, remains easy to use.

CorelDRAW's reputation for versatile excellence in its category has been well established since its first version in 1989. With the introduction of Version 2.0, however, Corel Systems has extended its well-judged basic toolset with some exciting new enhancements and capabilities.

The most notable of these is the Effects menu, which is full of tools that allow you to manipulate text and graphic objects in lots of gee-whiz ways. Version 2.0 also brings *CorelDRAW* up to date with *Windows 3.0*, with full support for that program's memory management and for the on-screen color capabilities of 256-color and even 24-bit graphics adapters.

Also new to Version 2.0 is Mosaic, a standalone "visual file manager" that displays thumbnails of your drawing files so that you can find them easily. This utility lets you assign keywords to your drawings and group them into compressed libraries. It also provides a simple screen-show facility and helps you access *CorelDRAW*'s 750-image clip-art collection, a sampler drawn from the collections of a variety of clip-art vendors.

MULTIFACETED DRAWING

What hasn't changed is the program's multifaceted drawing functions. At first glance, *CorelDRAW*'s toolbox looks minimal, but looks can be deceiving: You can use each of these tools in a variety of ways. For instance, there is no square tool, but you can easily draw one with the rectangle tool while using Ctrl, *CorelDRAW*'s universal constraint key, to constrain the box. Similarly, you can create circles and ellipses by using a single tool and then use the mouse to transform them into pie slices or segments. You can round the corners of a box by selecting the Shape tool and dragging one corner handle slightly. The Draw tool lets you draw in either freehand or Bezier mode, and you can customize the pen nib to achieve a variety of calligraphic effects.

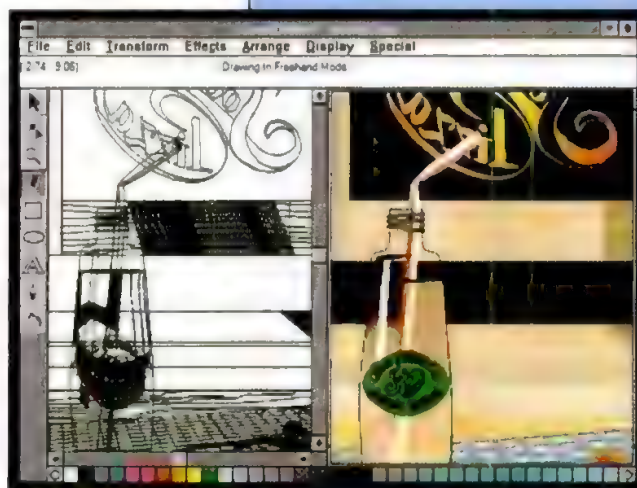
CorelDRAW is equally intelligent in the design of its workspace management functions. You can work in wireframe mode for faster screen redraws or in full-color mode; a split-screen mode gives you the benefit of both views. A single click selects an object; a double-click brings it into a special mode that lets you rotate or skew it by



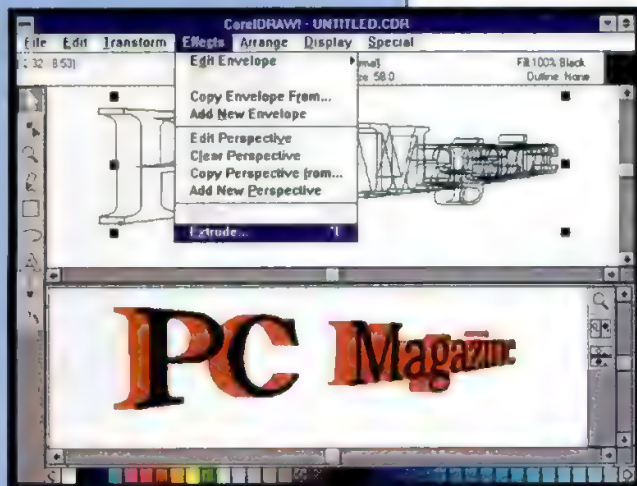
manipulating special handles. Double-clicking on nodes or segments with the Shape tool pops up a Node Edit menu at that point, which lets you add or delete points, change them from symmetrical intersections to cusps, or change lines to curves.

Well-constructed manuals, including a tutorial and a technical reference guide, help soften the learning curve. In addition, a 1-hour videotape demonstrates many of the program's functions.

Although excellent for general-purpose work, *CorelDRAW* is not perfect for every purpose. Its major limitation is that it offers only a single layer for illustrations. Unlike *Arts and Letters Graphics Editor*, *CorelDRAW* won't let you lock objects in place, so you have to be careful to avoid selecting or disturbing the wrong object



CorelDRAW gives you full control of its workspace. You can work in wireframe mode, color preview mode, or split-screen mode; the last simultaneously displays wireframe and color images.



CorelDRAW excels at text handling. You can apply any number of sophisticated effects (such as extruding, enveloping, and perspective) without sacrificing the text's editability.

when working. You can keep objects in relation by grouping them, but you will have to ungroup them to edit their elements, and *CorelDRAW* supports only ten levels of grouping. This won't be a problem for simple designs, but it can be a headache for very complex layouts. *CorelDRAW* also does not support dimensioning. For these two reasons, the program is probably not the best choice for technical illustration.

MASTER OF TYPE

CorelDRAW is strong on color. You can choose fill and outline colors interactively from a palette of up to 256 colors (now displayed conveniently in a scrollable strip at the bottom of the screen), or you can blend your own by using RGB, CMYK, or HSB methods. A full range of Pantone spot colors is also available. You can use 45 bitmap or 30 vector fill patterns, and you can create your own patterns from any part of a drawing or imported bitmap. You can build linear and radial fountain fills easily.

The program's true genius lies in its type-handling abilities. You can enter up to 400 characters into the text editor, then justify your copy, place it in multiple columns, or change the word or character spacing and leading attributes. You can lace text directly onto a drawing as a headline or enter it into a resizable bound-

ing box. The *CorelDRAW* program comes with 153 outline typefaces, plus symbol, dingbat, and musical typefaces. You can also use the Text tool to access a 3,000-piece library of symbols.

Just like its competitors, *CorelDRAW* lets you fit text to a curve or an object boundary. But it also lets you apply any of its special effects to text as well as to objects without sacrificing editability. The Enveloping function lets you create warping effects by stretching nodes on an object's envelope or bounding box. You can create 3-D effects by using the Extrude and Perspective functions, and you can use the Blend function to tween two objects with up to 200 intermediate steps. As in *Arts and Letters*, this latter function blends colors as well as shapes, so with a little practice it can be invaluable for generating subtle shadings in a drawing where a simple gradient fill won't create the desired effect.

These tools are even more powerful when you use them in combination. For instance, we used the enveloping function to produce the wrinkle on the checked tablecloth in our test drawing. And we created the appearance of fitting a label to the surface of the bottle by using perspective and extrusion effects and by fitting text to a curve; we shaded it with the blending tool. Unfortunately, the power of these tools can easily exceed your means of production. Because all transformations are produced mathematically on the fly from the original objects, it is all too possible to generate a rendering task so complicated that your PostScript interpreter cannot execute it. And printing, especially with more than one special effect applied, can be extremely slow. In these cases, you will want to simplify your image by converting the final results to curves (which comes at the expense of editability, of course).

CorelDRAW's other major flaw lies in its WFNBOSS utility, which converts various third-party font formats to

CorelDRAW's proprietary .WFN format. In Version 2.0, it has the added ability to convert .WFN fonts to either ZSoft Corp.'s TypeFoundry or Adobe Type 1 format. Unfortunately, in the version we tested, bugs in the Type 1 conversion made this exciting feature almost useless for that purpose; many punctuation and symbol characters translated wrong, and there were problems with font naming as well. By the time you read this, Corel Systems will have a maintenance release (Version 2.01) that will fix these bugs, but WFNBOSS still won't support hinting or other subtleties when exporting fonts to Type 1 format.

SOFT CURVES

Although *CorelDRAW* can handle simple object tracing within the program, for real autotracing power you need to go to *CorelTrace*, a standalone utility included with the program. *CorelTrace* gives you full control over all conceivable tracing parameters, including maximum line width, tightness of curves, curve frequency, and noise elimination. It proves highly successful at tracing any bitmap of reasonable quality. You can also incorporate color bitmaps into final images.

Since its introduction, *CorelDRAW* has been the premier illustration package for the PC. Its current version, despite its



CorelDRAW, Version 2.0

Corel Systems Corp., 1600 Carling Ave., Ottawa, Ontario, Canada K1Z 8R7; 613-728-8200.

List Price: \$695.

Requires: 286-based PC or better; 1MB RAM; 40MB hard disk space; EGA, VGA, or SVGA graphics adapter; DOS 3.1 or later; Microsoft Windows 3.0; mouse.

In Short: *CorelDRAW* is still the best choice for general users. The latest version of this perennial favorite offers useful special effects and some new tweaks. Our testing of *CorelDRAW* turned up some printing and font-conversion bugs, but the company should rectify these in the next maintenance release.

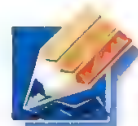
CIRCLE 602 ON READER SERVICE CARD

flaws, proves that this is an honor rightly deserved. Professional artists will be enamored of its power, while novices will appreciate its treasure trove of easy-to-use drawing tools.

MICROGRAFX

Designer, Version 3.1

by James Karney



Micrografx's *Designer* is best described as an industrial-strength illustration package for precision drawing. Version 3.1 of this \$695 program does not have much more in the way of new features than Version 3.0 (see "Tools for the Talented: Five Illustration Packages," *PC Magazine*, September 11, 1990). But with enhanced memory and



color support and also greatly improved performance, it has taken a major leap in optimization for its environment.

Designer is undeniably more complex than its competitors. It has a profusion of primary drawing tools dedicated to creating elements of a particular type. There are tools to create pie shapes, rectangles, lines, Bezier curves, arcs, and even parabolas, as well as special tools for specific tasks such as converting text or other elements to curves or slanting objects, or rotating text.

This profusion of tools makes *Designer* intimidating to a new user, but the power they offer makes the effort of learning it worthwhile. *Designer* offers a degree of precision and productivity that its rivals lack. It has an impressive array of measurement and placement tools, making it particularly good for technical illustration. And for truly large-scale drawings,

GRAPHICS ILLUSTRATION SOFTWARE



ILLUSTRATION SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	Digital Research Artline	Arts and Letters Graphics Editor	CorelDRAW	Designer
	\$595	\$695	\$695	\$695
GENERAL				
Interface	GEM	Windows	Windows	Windows
Expanded memory support	■	□	□	■
Overflows to disk	■	□	■	■
Network support:				
Run from server	□	■	□	■
Share network printers	□	■	□	■
File locking	□	□	□	■
Mouse/Digitizing tablet	■/■	■/■	■/■	■/■
Math coprocessor	□	■	□	□
DRAWING AND EDITING TOOLS				
Drawing tools:				
Polygon/Polyline	■/■	■/■	■/■	■/■
Freehand curve	■	■	■	■
Rectangle	■	■	■	■
Rounded corners	■	■	■	■
User-controlled	■	□	■	■
Circle/Ellipse	■/■	■/□	■/■	■/■
Arc/Parabola	■/□	□/□	■/□	■/■
Curve-editing options:				
Move nodes/Insert or delete nodes	■/■	■/■	■/■	■/■
View control points/active tangents	■/■	■/■	■/■	■/■
Smooth curves automatically	■	■	■	■
Close curved paths automatically	■	■	■	■
Object manipulation tools:				
Align to baseline/to page	■/■	■/■	■/■	■/■
Snap to grid/to baseline	■/■	■/□	■/■	■/■
Break or combine at node/at cursor	■/□	■/■	■/□	■/■
Duplicate/Mirror	■/■	■/□	■/■	■/■
Flip horizontally/vertically	■/■	■/■	■/■	■/■
Rotate interactively	■	■	■	■
Skew or shear	■	■	■	■
Copy object attributes	□	■	■	□
Convert to polygons/to curves	■/■	■/■	■/■	■/■
Clip to shape	■	■	■	■
Interpolation (tweening)	■	■	■	■
Special effects:				
Stretch/Envelope	■/□	■/■	■/■	■/□
Warp/Extrude	■/■	■/□	■/■	□/□
Perspective toward cursor/toward vanishing point	□/□	■/■	□/■	□/□
Apply effects to objects/to editable text	■/■	■/■	■/■	■/■
WORKSPACE MANAGEMENT				
Edit multiple documents	■	□	□	■
Work in wireframe/in full color	■/■	■/■	■/□	■/■
Lock/hide objects	■/■	■/■	■/■	■/■
Measure in inches/centimeters/points	■/■/■	■/■/■	■/■/■	■/■/■
Show ruler/grid	■/■	■/■	■/■	■/■
Measuring tool	■	□	□	■
Variable zoom/pan	■/■	■/■	□/□	■/■
Maximum pages per document	Unlimited	180	1	56

■—Editors' Choice

■—Yes

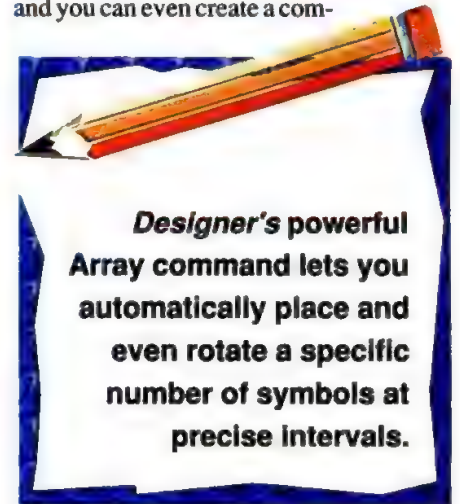
□—No

CONTINUES

you can define a working area equal to 54 8.5- by 11-inch pages.

WORTH THE TROUBLE

Designer is rich in features to control and manage complex drawings. It supports up to 64 layers per drawing, each of which you can manipulate or define separately. You can label any object or symbol with a symbol ID and then load it by name or export it as clip art. You can easily locate a group of symbols with the same name, and you can even create a com-



prehensive parts list of all the symbol elements in a drawing.

A powerful Array command lets you automatically place and even rotate a specific number of symbols at precise intervals, speeding the creation of diagrams and matrixes. You can also use this command in conjunction with clip-art libraries to automate the placement of elements in a drawing, such as the lights on a bridge. *Designer* supports dimensioning, and it will automatically update the dimensions as you resize objects.

Designer is highly customizable. You can speed up selection and reduce screen clutter by selectively adding or removing tools in the toolbox, and you can also customize the menus. You can add custom fill patterns, colors, and other attributes to dialog boxes for easy selection. The most recently used font and line selections are always added to the appropriate menu, making it easy to modify multiple objects in sequence.

Designer lacks its rivals' advanced typographic controls and their fancy extrusion and perspective effects. But for most jobs, it more than holds its own in handling text. The latest version lets you enter or edit text right on the illustration; you don't need to use a separate editing

ILLUSTRATION SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	PC	PC
	Digital Research Artline	Arts and Letters Graphics Editor
	CorelDRAW	Designer
WORKSPACE MANAGEMENT (continued)		
Place elements outside of page	☒	☐
Maximum layers	Unlimited	1
Print list of elements	☐	☒
Customizable toolbox	☒	☐
Keystroke macros/Script language	☒ ☒	☐ ☐
TYPE HANDLING		
Text editing on-screen	☐	☒
Border on text box	☒	☐
Convert text to curves	☒	☒
Wrap text around curved path	☒	☒
Align text on baseline	☐	☒
Indent text	☒	☐
Justify text	☐	☒
Fit text to box/Fit box to text	☒ ☒	☐ ☐
Control leading in points	☐	☒
Specify tracking for block	☐	☒
Specify kerning for kern pair	☒	☒
Font support:		
Number of typefaces supplied	45	61
Minimum-maximum type size (points)	2-500	2-2,000
Third-party soft fonts:		
Adobe Type 1	☒	☒
Bitstream (Fontware/Speedo)	☒ ☐	☒ ☒
Nimbus-Q	☒	☒
Agfa	☐	☒
Printer-based fonts	☐	☒
HP cartridge/HP soft fonts	☐ ☐	☐ ☐
PostScript fonts	☒	☒
Download symbols as fonts	☐	☐
LINE, PATTERNS, AND FILLS		
Lines:		
Line styles provided	9	6
Line end styles provided	4	6
User-definable	☐	☐
Arrowheads	☒	☐
Patterns:		
Predefined patterns provided	None	250
Edit and store new patterns	☒	☐
Gradient fills:		
Horizontal/vertical	☒ ☒	☒ ☒
Angled/radial	☒ ☒	☒ ☒
Dimensioning	☒	☐
COLOR HANDLING		
Palettes:		
Select colors by name/ from palette	☒ ☒	☒ ☒
Preselected color palettes	14	19
User-defined palettes	☒	☒
Maximum colors:		
In total palette	1 billion	16.7 million
On-screen (undithered)	16	16.7 million
Color models:		
RGB (red-green-blue)	☒	☒
HSL (hue-saturation-lightness)	☒	☒

☒ —Editors' Choice ☒ —Yes ☐ —No

CONTINUES

ILLUSTRATION SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	Digital Research Artline	Arts and Letters Graphics Editor	CorelDRAW	Designer
COLOR HANDLING (continued)				
CMYK (cyan-magenta-yellow-black)	■	■	■	■
Pantone Matching System	■	■	■	■
Internal color storage	RGB	RGB or CYMK	CYMK	RGB
Separations (process color/spot color)	■/■	■/■	■/■	■/■
FILE IMPORT AND EXPORT				
Vector formats (read/write):				
CGM (Computer Graphics Metafile)	■/■	■/■	■/■	■/■
.DXF (AutoCAD)	■/■	■/■	■/■	■/■
.GEM (GEM vector)	■/■	■/■	■/■	■/■
HPGL	■/■	■/■	■/■	■/■
HPGL/2	■/■	■/■	■/■	■/■
.PIC (Lotus 1-2-3)	■/■	■/■	■/■	■/■
Pict (Macintosh)	■/■	■/■	■/■	■/■
SCODL (Agfa Matrix)	■/■	■/■	■/■	■/■
.WMF (Windows Metafile)	■/■	■/■	■/■	■/■
.WPG (WordPerfect Graphics)	■/■	■/■	■/■	■/■
PostScript support:				
EPS output	■	■	■	■
With TIFF header	■	■	■	■
With .WMF header	■	■	■	■
.AI (editable EPS) import/export	■/■	■/■	■/■	■/■
Clip-art images included	190	5,000	750	1,700
Paper catalog/Cataloging software	■/■	■/■	■/■	■/■
Bitmapped formats (read/write):				
.GIF	■/■	■/■	■/■	■/■
.PCX	■/■	■/■	■/■	■/■
TIFF	■/■	■/■	■/■	■/■
RGB (24-bit color)	■/■	■/■	■/■	■/■
Indexed	■/■	■/■	■/■	■/■
.TGA (Targa)	■/■	■/■	■/■	■/■
Import bitmaps into image	■	■	■	■
Import bitmaps for tracing	■	■	■	■
Levels of tracing accuracy	100	Variable	10	3
Trace color bitmaps	■	■	■	■
Export options:				
User-selectable output size/resolution	■/■	■/■	■/■	■/■
Export selected objects only	■	■	■	■
OUTPUT OPTIONS				
Print multiple images per page	■	■	■	■
Background printing	■	■	■	■
Draft-mode (low-resolution) setting	■	■	■	■
Vector clipping on plotted output	■	■	■	■
Custom slide service link	MAGICorp	None	None	MAGICorp, SlideMasters
Screen shows	■	■	■	■
DOCUMENTATION AND SERVICE				
Tutorial manual/videotape	■/■	■/■	■/■	■/■
Sample files included with package	■	■	■	■
On-line help	■	■	■	■
Toll-free tech support	■	■	■	■

■—Editors' Choice

■—Yes

□—No

ENDS

Computers, FCC Class A, Class B, and You — or When is it better to get a B than an A?

You need to know the difference between computers that meet the FCC class B radio frequency emissions standards and those that meet only the Class A standards.

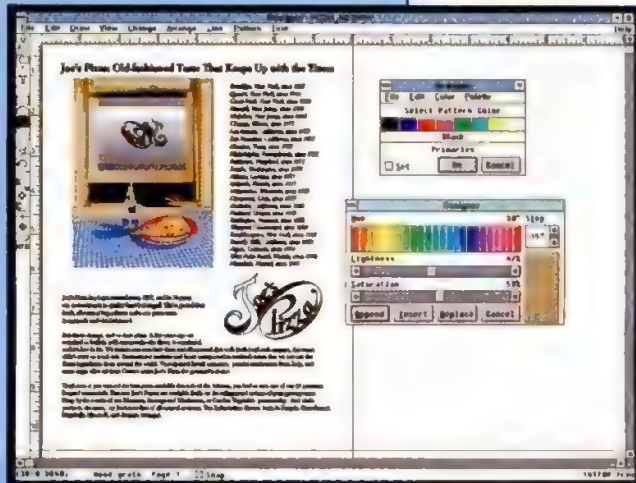
Computers emit radio signals in their operation. Because these signals may cause interference to radio and television reception, the marketing and the use of computers is regulated by the Federal Communications Commission. Under federal rules, computer users are responsible for remedying interference, including interference in neighboring homes.

Computers certified by the FCC as meeting the Class B standard are less likely to cause interference to radio and TV reception than those that have been verified by the manufacturer or importer to the Class A standards. Only Class B certified computers may be advertised, sold, or leased for use in residences. A similar regulatory program applies in Canada.

Buyers seeking computers for use in homes (including offices at home) should shop for computers and peripherals which have been Class B certified. These devices carry a label with an FCC ID number. Both new and used Class A verified devices may be sold only for use in commercial and industrial locations. Signals from computers are more likely to be masked by electrical noise from other equipment in such an environment. These areas are also likely to have fewer radios and TVs. Accordingly, equipment marketed only for use in these locations may meet the less rigorous Class A standard. Class B certified equipment may be marketed for use in residences as well as commercial and industrial locations.

As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.

GRAPHICS ILLUSTRATION SOFTWARE



Designer offers a preview mode that allows full editing of both text and graphics. The package also has custom toolboxes.

window. You can apply typographic controls to individual characters or to blocks of text, and you can easily fit editable text to curve, though you still cannot apply gradient fills to text objects without converting them to curves first. You can use Bitstream- and URW-compatible fonts, and the program includes 41 typefaces.

Version 3.1 supports spot and process color separations in the same illustration and has good color controls. You can mix colors using RGB, CMYK, or HSL color models, and defining a custom palette is easy to do. The program provides full 256- and 24-bit color support when used with monitors and cards capable of such output. When we used Micrografx's PostScript driver, the colors in the text illustration translated well into gray scales when output to a PostScript printer that prints in black and white. A special feature is the ability to send bitmapped images as part of a .DRW file to a PostScript printer as color separations.

As with most illustration programs, *Designer* displays complex images slowly, and incorporating bitmaps slows things down even more. The performance enhancements in Version 3.1, however, make it much faster in handling screen redraws than earlier versions: On some files we tested, its printing speed improved by more than 100 percent. *Designer* offers a number of options to speed operation, including the ability to work with wireframes only, to mute complex fills, and to

select only specific layers. You can edit the image in any of these modes; you don't have to jump back and forth between separate preview and editing modes.

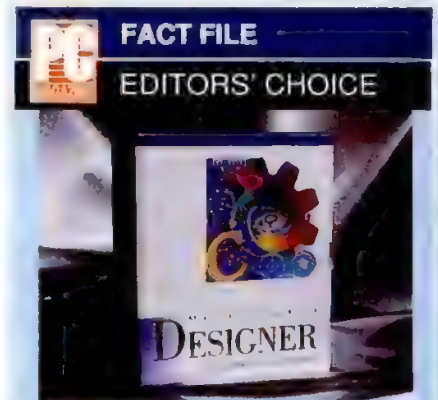
PRESENTING YOUR WORK

Despite its power, *Designer* isn't just for technical illustrators. It includes a fairly sophisticated screen-show capability, with transition effects for on-screen presentations, making it suitable for creating elaborately designed custom presentations. A built-in communications utility (*Telegrafx*) lets you send files to service bureaus for slide output, while an array of drivers (including Micrografx's enhanced PostScript driver and its SCODL driver) give you a broad array of in-house options. Many of the symbols in its extensive collection of over 1,700 images are technically oriented, but there are plenty of useful business images as well, and Micrografx will create custom sets of images for a fee.

Designer has a wide range of file import and export filters, enough to support almost any other graphics or publishing program.

Version 3.1 adds the much-needed ability to import Adobe Illustrator-format EPS files and also supports WordPerfect .WPG files. A custom link with PageMaker lets you incorporate *Designer*'s .DRW files directly into PageMaker documents, rendering them at high quality with Micrografx's own PostScript driver. Its excellent autotracing utility does a good job of converting color .PCX and TIFF images into editable images with the appropriate color fills.

Designer's impressive array of features makes it a valuable addition to any



FACT FILE

Editors' Choice
Designer, Version 3.1

Micrografx, 1303 Arapaho Rd., Richardson, TX 75081; 800-733-3729, 214-234-1769.

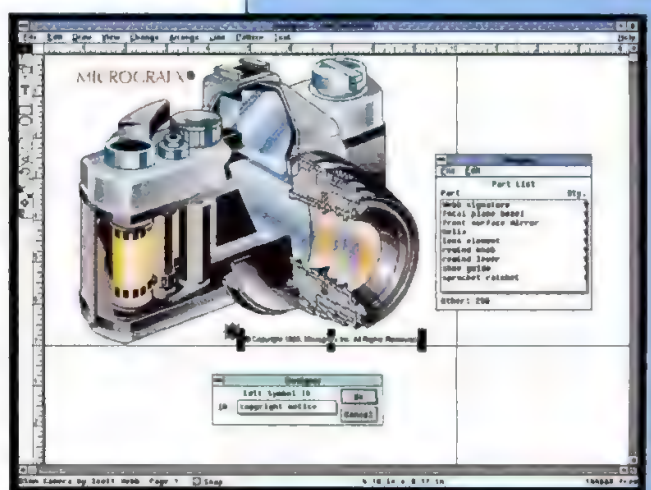
List Price: \$695.

Requires: 286-based PC or better (386-based PC or better recommended); 1MB RAM; 10MB hard disk space; EGA, VGA, or SVGA graphics adapter; DOS 3.1 or later; Microsoft Windows 3.0; mouse.

In Short: The latest version of the power user's choice offers dramatically improved performance and competitive enhancements, including the ability to import EPS files. Though not as simple to grasp as the others, *Designer* rewards the committed user with the productivity that comes from power and precision.

CIRCLE 603 ON READER SERVICE CARD

software library, but it is the program's power and precision that make it especially attractive to technical illustrators and others in need of precision drawing tools. It's not as easy to master as its competitors, but it repays effort with superb power and productivity.



Among *Designer*'s more powerful features, it can identify symbols by name for use as clip art, and it can create parts lists for reference and for export to other programs.

A close-up, high-angle photograph of an Intel 386SX processor mounted on a green printed circuit board (PCB). The processor is a square chip with a black plastic package, featuring the Intel logo and the text "386SX" and "STEP 20". The PCB is densely packed with various electronic components, including capacitors and other integrated circuits. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the intricate details of the hardware.

ZEOS[®] just made
every other 386SX
obsolete.



The Incredible New ZEOS 386SX-20!

Only \$1195!

There is nothing else like it.
And starting complete at only \$1195,
there probably won't be for quite some time.
Come on in and take a look!

Z. ZERO-WAIT \$1195!

drive interface right on the motherboard. This not only saves you an expansion slot but enables us to provide you with the very latest (and fastest) IDE disk drives as well. Not only that, but your system will also accommodate additional hard drive technologies (including ESDI, SCSI, etc.) should you wish to add them. And your ZEOS Advanced Engineering Advantage

of pure clean power. This isn't some cheap power supply used to keep the price down—this is the *very best*. Because the very best is just what your system deserves. It deserves to live a long time too.

EXTRA COOLING. LONGER LIFE.

That's why you'll receive the unique *patent pending* ZEOS cooling system. This includes not just one but *two* whisper quiet cooling fans. Why two fans? Because we know that if, as an

Performance. Quality. Price. Support.

doesn't stop there.

On the I/O (Input/Output) side, we've freed up another slot for you too. We've taken the celebrated high speed ZEOS I/O card and put it right on the motherboard. The result is two fully software configurable *high speed* serial ports, the parallel port and even a game port *built right into* the motherboard!

ROOM TO EXPAND. POWER TOO.

If you should open up your system you'll see expansion room galore. Because at ZEOS, we always give you room to grow. That isn't just limited to more open expansion slots either. We give you our SpaceSaver case which has *seven* drive bays yet is *smaller* than most full size cases that have only five drive bays. But what of expansion *power*?

Having the room to expand is only part of the story, we give you the *power* to expand as well! Your new ZEOS 386SX-20 will have the best power supply money can buy and this baby will be pumping your system with a full 200 WATTS

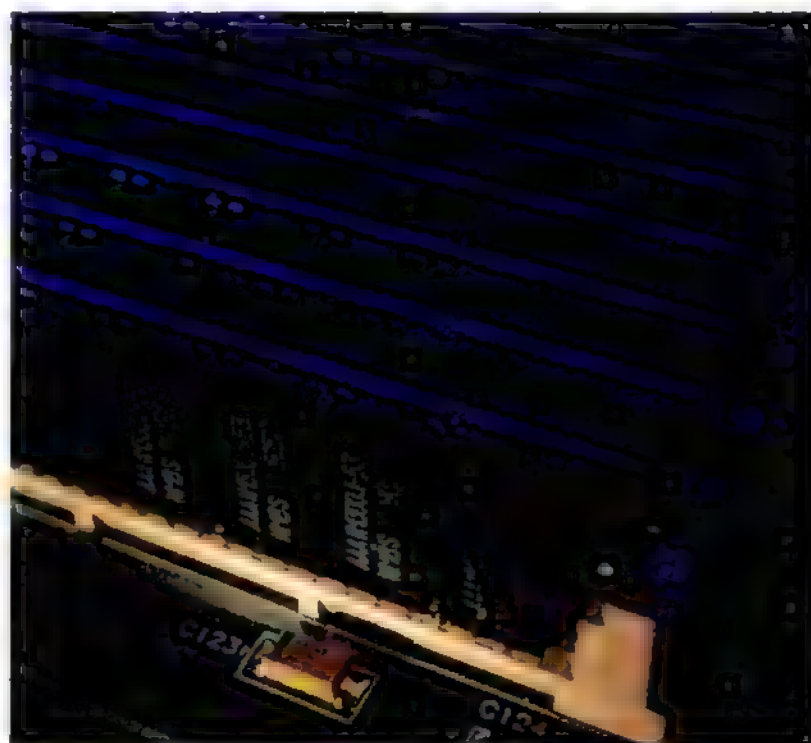
example, you lower the ambient interior temperature of your system by 10°C, you can up to double the life of the components inside! Now that's quality. Others don't do it. We do, because at ZEOS providing you with absolute quality and reliability are of primary importance. It's a case of quality. Speaking of which...

The beauty of your ZEOS case is much more than skin deep. The steel ZEOS uses is specified to be 0.20mm thicker than that of cases used by many of our competitors. And the fit is finely crafted to provide a rock solid system while meeting the stringent requirements of our Underwriters Laboratories listings. True, quality touches cost a *little* more but it all adds up to *value*, and *value* is why you're buying a ZEOS system!

Here we have discussed how your new ZEOS 386SX-20 provides you with stellar performance, unequalled quality and absolute reliability. With all of this, what more could there be? From ZEOS lots more.

ZEOS 386SX-20. Only \$1195!

INCREDIBLY FAST 53ns DRAM



24 HOUR A DAY TOLL FREE TECHNICAL SUPPORT!

Like ZEOS 24 Hour a Day Toll Free Technical Support. Most of our competitors still offer only part time technical support. Yet for the last two years ZEOS technicians have been standing watch for our customers—twenty-four hours a day, 365 days a year. We are *always* here for you, or anyone else using your ZEOS system, *any time* of the day or night.

And that's only the start of your ZEOS Customer Satisfaction Package. Add to it our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Replacement Policy. You're going to be very satisfied. We don't just say it. *We guarantee it.*

ZEOS sets the pace for the industry in performance, in quality and reliability, and in service as well. When you buy from ZEOS, you are buying the *very best*. Perhaps that's why, in their service and reliability issue, *PC Magazine* discovered that ZEOS 386SX systems were rated #1 by customers: #1 in technical support, #1 in repair services, #1 in customers who would buy again!

So why not give us a call. Your ZEOS product partnership begins the moment you are greeted by your friendly ZEOS Systems Consultant. Calling on years of experience and knowledge, your ZEOS Systems Consultant is prepared to help answer *any* questions you might have. You'll find talking with your ZEOS consultant is just like talking with an old friend who happens to know quite a bit about computers. Good knowledgeable advice.

ORDER YOUR OWN ZEOS 386SX-20 TODAY!

Ordering is easy too. Simply pick up the phone and give us a call now at 800-423-5891. Buying your new ZEOS 386SX is perhaps the best purchase decision you'll ever make! After all, your satisfaction is absolutely *Guaranteed*.

ORDER NOW TOLL FREE:

800-423-5891

DON'T FORGET THE OPTIONS!

As *PC Magazine* said, ZEOS offers "more options than even the most configuration hungry hound could possibly need." Because every ZEOS system is custom built you may choose from a huge selection of hard drives, video packages and many other options. On-site service is available too. Call 800-423-5891 for details.

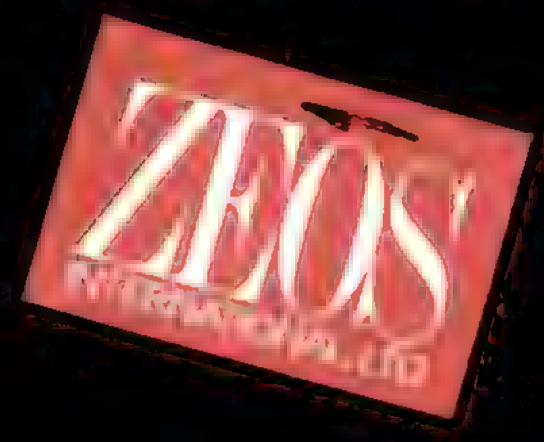
YOUR COMPLETE ZEOS 386SX-20 ZERO-WAIT HARD DRIVE SYSTEM INCLUDES ALL OF THESE FEATURES. AND MORE!

ONLY \$1195

- Genuine Intel® 80386SX 20MHz CPU. 8/20MHz Dual Speed, Keyboard selectable.
- 512K of High Speed 53ns DRAM providing Zero-Wait performance right up thru a total of 16MB on the motherboard.
- Fast 42MB IDE Hard Drive, Teac® 1.2MB Floppy Drive.
- ZEOS 14" Flat Screen High Res amber monitor with Tilt/Swivel Base.
- Genuine Hercules® Brand graphics controller!
- ZEOS/RS 101 key SpaceSaver Keyboard with pleasant Tactile/Click feel.
- Two High Speed Serial plus One Parallel and One Game port on the motherboard.
- 7-16 and 1-8 bit expansion slots.
- Speed demons appreciate our Shadow RAM/EMS capability, and full 387SX math coprocessor support.
- Includes our 7-bay ZEOS SpaceSaver case. Two cooling fans and 200 Watt power supply for added expandability and reliability. Top notch.
- 30 Day Absolute Satisfaction Money Back Guarantee, Full One Year Limited Warranty and our Express Replacement Policy.
- Wrap it all up with 24 Hour a Day, 365 Day per Year Toll Free Technical and Sales Support on your ZEOS Hotline. You've got a winner!

ORDER NOW TOLL FREE: 800-423-5891

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
Hearing Impaired (TDD): 800-228-5389
Government Orders: 800-245-2449
Outside US and Canada Call:
612-633-6131
MasterCard, VISA, Discover, Am Exp,
Z-Card and COD.
Open 24 Hours a Day, 365 Days a year!



ZEOS 386SX-20.

\$1195!

ure. Your #1 Choice!

ZEOS 386SX-20 ADVANTAGES:

- ✓ Special package savings are available incorporating our most popular upgrades. Many packages include

Microsoft® DOS
plus Windows and
a Mouse!

IT OUT!

ZEOS 386SX-20

ombination of
t available any-

e. Many are of
portance, while

ubtle yet critical
ate satisfaction.

r PC Magazine

OS 386SX owners

Customers Who

again!" We think

ZEOS is your #1

e as well!

- ✓ For a limited time every ZEOS Windows system also comes with Lotus 1-2-3 for Windows plus Lotus' incredible new Windows word processor *Ami Pro 2.0!*

- ✓ Everybody loves ZEOS'

24 Hour a Day Toll Free Technical Support. You can call for advice any time of the day or night, 365 days a year!

- ✓ Your new system is backed by our 30 Day Absolute Satisfaction Money Back Guarantee, One Full

Year Limited Warranty and our Express Replacement Policy.

- ✓ Buy with confidence. ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). We've been around since 1981. We'll be around for a long time to come as well.

- ✓ ZEOS offers you a wide variety of payment options including MasterCard, VISA, Discover, American Express plus our own Z-Card, the ZEOS credit card featuring low consumer rates. Credit terms are also available along with attractive leasing programs to qualified corporate customers. We also ship COD if you wish.

- ✓ Friendly ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time.

When you add it all up, there's nothing like buying from ZEOS. There is certainly nothing like the incredible ZEOS 386SX-20!

Why not give us a call right now!

CALL NOW TOLL FREE:

800-423-5891

Your new ZE Only Feature for Featu

☒ Incredibly fast *53 nanosecond* DRAM giving true Zero Wait State performance. Your *entire* memory is like one huge cache, operating flat out at full processor speed.

☒ You may expand your system with up to 16 megabytes of memory right on the motherboard!

☒ Speaking of motherboards, your ZEOS 386SX-20 motherboard is designed and manufactured by ZEOS, right here in the USA.

☒ Your new system features the *exclusive* ZEOS seven bay desktop case, smaller than most five bay cases yet plenty of room for future expansion.

☒ *Two* whisper quiet cooling fans move more air through your system increasing reliability and component life. Others seldom offer this important added feature.

☒ Your *entire* system is UL® listed (not just the power supply). Few others offer this security; we wonder why.

☒ Eight slots. One for the video, seven more open providing plenty of room for future expansion. Designed for you!

☒ FCC Class B approved, of course.

CHECK YOUR EXCLUSIVE

☒ Two high speed serial ports, one parallel port and one game port.

☒ Our top quality 200 watt power supply providing you with plenty of power for your present *and* future needs.

☒ ZEOS uses *only* genuine Teac® floppy drives. Accept nothing less.

☒ Monochrome TTL systems feature Genuine Hercules® Brand graphics controllers. Only the best for you.

☒ VGA color systems feature our high-res ZEOS 1024x768 monitor with the incomparable SpeedStar Plus card!

CHECK

Your new ZE
offers a co
features no
where else
obvious imp
others are s
to your ultim
No wonder
reported ZEC
to be #1 in "
Would Buy A
you'll agree,
choice

TAKE YOUR PICK!

Choose from 4 great money saving packages.

or specify your own custom configuration!

Your complete ZEOS 386SX-20 system! Package #1.

ONLY \$1195

Your complete 386SX-20 system for only \$1195. Including all the features described in the column to the left. Highlights include:

- Screaming ZEOS 20MHz 386SX motherboard.
- 512K of High Speed 53ns DRAM, 16MB motherboard capacity.
- Ultra-fast 42MB IDE Hard Drive.
- Genuine Teac® 1.2MB floppy.
- Shadow RAM/EMS capability, 387SX support.
- ZEOS 14" Flat Screen Tilt/Swivel Amber Monitor.
- Genuine Hercules® Graphics Card.
- Two Serial, one Parallel and one Game Port.
- ZEOS SuperCase: 2 Cooling Fans, 7 Bays, 200 Watt power supply.
- ZEOS R/S 101 keyboard.
- 30 Day Absolute Satisfaction Money Back Guarantee.
- One Full Year Limited Warranty, with Express Parts Replacement.
- 24 Hour a Day Toll Free Technical Support.

The Incredible Upgrade Package #2

ONLY \$1695

We take Package #1 and upgrade your Editor's Choice system to include:

- Top quality 16-bit high res 1024 VGA color graphics card.
- ZEOS 14" High Res 1024x768 VGA Color Monitor/Tilt & Swivel.
- One full Megabyte of 53ns DRAM.
- A second Teac floppy, 3.5", 1.44MB.
- Microsoft® DOS 5.0 with Disk Cache Software.



Lotus Software Bundle!

**For a limited time
only, order any ZEOS
Windows system (like
packages #3 and #4
at right) and we will
also include Lotus
1-2-3 for Windows
and Ami Pro 2.0—
at no additional
charge!**

YOUR #1 CHOICE

From a family of eight
PC Magazine Editor's
Choice systems. The
incredible ZEOS
386SX-20!

Incredible Upgrade Package #3

ONLY \$1995

Now take Two megabytes of memory and a larger hard drive and save even more! Your extras now include:

- High Speed 85MB IDE Hard Drive.
- Top quality 16-bit high res VGA color graphics card.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt & Swivel.
- Two full Megabytes of High Speed 53ns DRAM.
- A second Teac floppy drive, 3.5", 1.44 MB.
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a Microsoft mouse!

Incredible Upgrade Package #4

ONLY \$2295

Want an even bigger hard disk? Package #4 gives you all the extras *plus* our Fast 130MB hard drive. Outrageous savings!

- High Speed 130MB IDE Hard Drive.
- Top quality 16-bit high res 1024 VGA color graphics card.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt & Swivel.
- Four full Megabytes of High Speed 53ns DRAM.
- A second Teac floppy drive, 3.5", 1.44 MB.
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a Microsoft mouse!

**ORDER NOW TOLL FREE:
800-423-5891**

Inverted Foldout slip-sheet

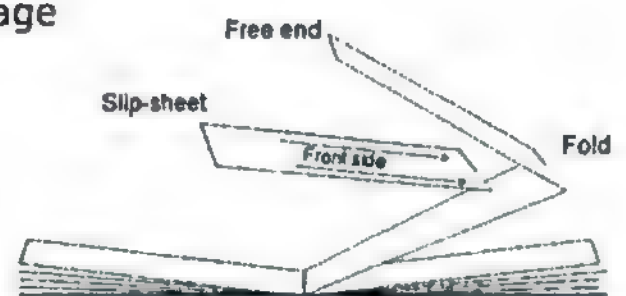


GbsSlipSheet-001



Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page

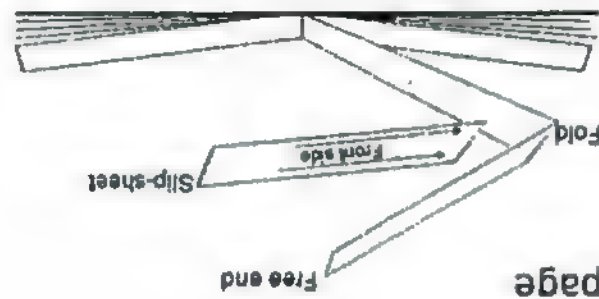
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

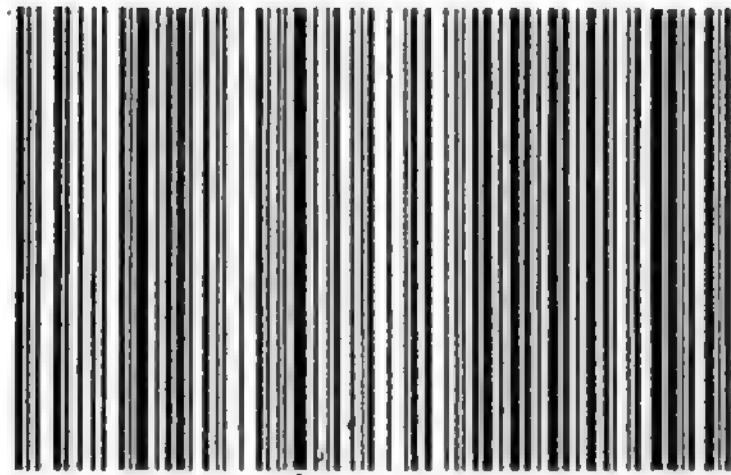
4. Close the page and slip-sheet



Folded edge of the page

1. Follow instructions on the other side

Inverted Back



GbsSlpBack-001B

Back

1. Follow instructions on the other side



That's right! Now you can own the incredible ZEOS 386SX-20 for as little as \$1195. The price is amazing but that's not all.

Should you decide to purchase it (and we think you will), you will be acquiring the most advanced personal computer system of its kind. Incorporating the very latest in personal computer technology, your new ZEOS 386SX-20 is quite simply the very best you can buy—at any price. Why?

Pe

FAST MEMORY. INCREDIBLE PERFORMANCE.

For starters, we're including incredibly fast *fifty-three nanosecond* DRAM. When we sat down to design this system we polled all the existing technology. We knew that while every 20MHz 386SX processor crunches data at the same rate, making that data available to the processor for immediate crunching is the key. The faster the DRAM (the computer's memory that holds the data for crunching), the faster the data got crunching.

Until now, the best way to get data to a 20MHz processor was to use "cache memory"; the next best is called page/interleaving. Yet a typical cache scheme of say 32K (only 1/16 of a megabyte) holds only a fraction of the memory's data for quick crunching by the processor. The rest of the system's memory is usually only 80 nanosecond (ns) or even slower 100ns DRAM. That's where ZEOS' blazing *53ns memory* comes in.

With the 53 nanosecond memory in your new ZEOS 386SX-20, your system's processor has *instant access* to all the memory in your system—without using a cache. This instant access to *all* your system's memory means your data is available for immediate crunching. Bottom line—an *incredibly* fast computer at a *very* reasonable price.

INCREDIBLY FAST. JUST FOR STARTERS.

Incredibly fast indeed! Yet that's only the start of your new high technology ZEOS 386SX system. We've captured the latest in other technologies as well. Take hard drives for instance.

Your new high speed ZEOS 386SX-20 system includes our IDE hard drive interface and floppy

Computers Now! SM

Our Most Popular 386SX-20. Ready to ship today!

RIGHT NOW. GUARANTEED!*

Yes, we can ship this new ZEOS 386SX today! We've built up an extra supply of our hottest selling ZEOS 386SX model including the Lotus software bundle.

Here's how it works. We have this incredible ZEOS 386SX-20 VGA system pre-built and ready to ship. While supplies last, we will ship this system to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time M-F.
2. Credit Cards are subject to authorization.
3. Your order must be for the ZEOS 386SX system configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.



**Yes! We can ship
your new ZEOS system
Right Now!
Place your order
by 1:00 PM Central
Time and we'll ship
today. Guaranteed!***

***OUR GUARANTEE TO YOU:**

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

This is not just any computer. It's the incredible ZEOS 386SX-20—from a family of Eight *Editor's Choice* systems! Plus, for a limited time only we'll be including Lotus 1-2-3 for Windows plus Ami Pro 2.0 at *no additional charge!*

So why not give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today. Call now Toll Free 800-423-5891!

The Incredible 20MHz ZEOS 386SX System. 2MB 53ns RAM, 85MB Drive, 1024 VGA Color & Lotus 1-2-3 & Ami Pro 2.0!

ONLY \$1995.

It's what everyone wants. Our new 386SX, loaded with features and ready to ship to you today!

- 386SX-20 CPU, 8/20MHz.
- 2MB of Zero-Wait 53ns DRAM, expandable to 16MB.
- 85MB High Speed IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor.
- High Speed 16-bit SpeedStar Plus VGA card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built in.
- 7-16, 1-8 bit expansion slots. 80387SX math coprocessor support.
- Rugged ZEOS SpaceSaver case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 200 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders Dial: 612-633-1325
In Minnesota Call: 612-633-4591
MasterCard, VISA,
Discover, AmEx,
Z-Card and COD
Open 24 Hours a
day, 365 Days
a year.



Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: Microsoft, MS DOS and Windows of Microsoft Corporation, ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol, ZEOS. Lotus is a registered trademark of Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, a wholly-owned subsidiary of Lotus Development Corporation.

Apply Now for the Z•CARD!

NO ANNUAL FEE!

SEND FOR YOUR ZEOS CREDIT CARD



- Low Consumer Rate!
- No Annual Fee!

Now you can send for your own ZEOS Credit Card. It works just like a MasterCard or Visa for ZEOS purchases.

Fill out your Z•Card™ Application and mail it today to ZEOS International, Z•Card Processing Center, 530 5th Avenue N.W.,

St. Paul, MN 55112. We'll give you a call as soon

as your credit line is established!*

Please complete all appropriate sections, *providing at least two years residence and employment history*. **THIS IS NOT A CREDIT AGREEMENT!** One will be sent to you upon authorization of an account. (This Form Must Be Signed To Process Your Order.) All Financed Purchases Are Subject To Credit Approval. **If You Have Any Credit Questions, Please Call 800-421-8942 For Assistance. Thank You!**

A married person may apply for individual credit. I am applying for (please check appropriate box):

- ☐ **JOINT CREDIT** with another person. Complete entire application.
- ☐ **INDIVIDUAL CREDIT** but rely on income or assets of another person as a basis for repaying the credit requested. Complete entire application.
- ☐ **INDIVIDUAL CREDIT.** Do not complete Section C.**

**If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS: YOU MUST DISCLOSE YOUR MARITAL STATUS:

☐ married ☐ unmarried ☐ legally separated

A. YOUR PERSONAL INFORMATION

Name _____

Home Phone (_____) _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Since? (Mo./Yr.) _____ ☐ Buy ☐ Rent ☐ Other _____

Previous Address _____

City _____ State _____ Zip _____

Employer _____ Since? (Mo./Yr.) _____

Monthly Gross Salary \$ _____ Daytime Bus. Phone (_____) _____

Previous Employer _____ From - To _____

Occupation _____

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying this obligation.

Additional Monthly Income \$ _____ Source: _____

Name & Address of Nearest Relative Not Living With You _____

Relationship _____

B. CREDIT INFORMATION

PLEASE TELL US IF YOU HAVE: Checking Account ☐ Yes ☐ No Savings Account ☐ Yes ☐ No

	Y/N	How Many?	Y/N	How Many?
Bank Loan	_____	_____	Dept. Store Charge Card	_____
VISA	_____	_____	Credit Union Account	_____
MasterCard	_____	_____	Other Major Charge Cards	_____
Finance Company Loan	_____	_____		

C. JOINT APPLICANT INFORMATION

Joint Applicant's Name _____

Soc. Sec. No. _____ Date of Birth ____/____/____

Address _____ Apt. _____

City _____ State _____ Zip _____

Home Phone (_____) _____ Date of Residence (Mo./Yr.) _____

Joint Applicant's Employer _____ Since? (Mo./Yr.) _____

Bus. Phone (_____) _____ Monthly Gross Salary \$ _____

CUSTOMER AUTHORIZATION

I authorize ZEOS International, Ltd. or its assignees to investigate credit records and to report my performance hereunder to credit agencies. I hereby certify that the following information is furnished to you for the purpose of obtaining credit and is true and correct to the best of my knowledge and belief.

Applicant's Signature _____

Date _____

Joint Applicant's Signature _____

Date _____

FOR MARRIED WISCONSIN APPLICANTS:
I acknowledge that the obligation described herein is being incurred in the interest of my marriage or family.

Buyer's Signature _____ Date _____

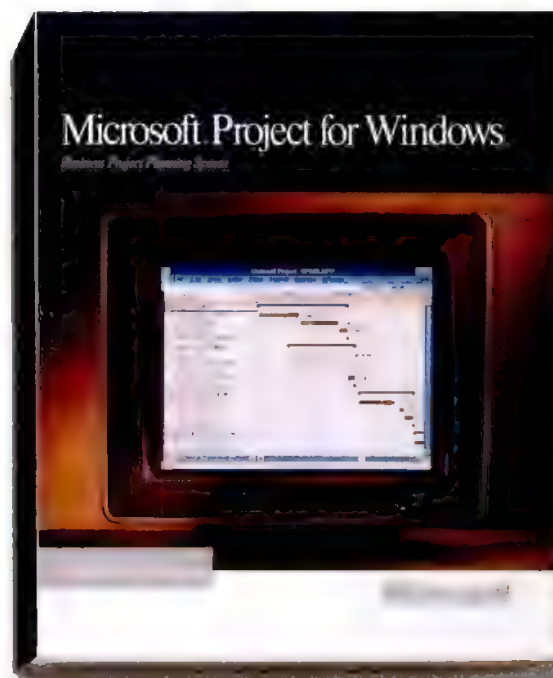
There are costs associated with the use of this credit card. To obtain more information about these costs, call us at 800-421-8942 or 612-635-0613 or write to ZEOS, Z•Card Processing Center, 530 5th Avenue N.W., St. Paul, MN 55112.

NY—A consumer credit report may be requested in connection with this application or in connection with updates, renewals or extensions of any credit granted as a result of this application. If I subsequently ask for this information, I will be informed whether or not such a report was requested and, if so, the name and address of the agency that furnished the report.

OH—THE OHIO LAWS AGAINST DISCRIMINATION REQUIRE THAT ALL CREDITORS MAKE CREDIT EQUALLY AVAILABLE TO ALL CREDITWORTHY CUSTOMERS AND THAT CREDIT REPORTING AGENCIES MAINTAIN SEPARATE CREDIT HISTORIES ON EACH INDIVIDUAL UPON REQUEST. THE OHIO CIVIL RIGHTS COMMISSION ADMINISTERS COMPLIANCE WITH THIS LAW.

*Financing not available in Alaska, Hawaii or outside the continental U.S.

Microsoft Project for Windows introduces an amazing management technique. Your own.



When you use Microsoft® Project for Windows, just be yourself.

Because you'll have all the power and flexibility you need to manage any size project your own way.

Let's say you want to create your own filters, so you can find specific types of information. No problem.

And if you've ever wanted custom tables and fields that allow you to view and report data any way you want, relax, now you have them.

There's even outlining to create customized reports, tailored to your audience,

showing only the level of detail you want.

And you can do all this with the same project manager *PC Week*, *PC Magazine*, *PC World* and *Software Digest* call the best in its category.

If you would like more information on Microsoft Project for Windows, or a working model for \$9.95*, call us at (800) 541-1261, Dept. V29. We won't tell you how to do your job. We'll just help you do it.

Microsoft®

*Applicable sales tax, shipping and handling not included. Offer good only while supplies last and only in the 50 United States. When ordering the working model, inquire about specific system requirements. In the 50 United States, call (800) 541-1261, Dept. V29. For information only: In Canada, call (800) 563-9048; outside the United States and Canada, call (206) 936-9661. ©1991 Microsoft Corporation. All rights reserved. Microsoft and the Microsoft logo are registered trademarks and Windows is a trademark of Microsoft Corporation.

ILLUSTRATION SOFTWARE: How We Tested

by Lori Grunin

Our testing suite for illustration software consisted of seven tasks, five of which centered on the production of the mock advertisement pictured here (printed on a QMS ColorScript 100 Model 10 printer). The entire exercise is complex enough to put the package's drawing, object-handling, color-handling, and special-effects capabilities through their paces.

Work on the exercise begins with a pizza-parlor photograph, which is comprised of several elements that are challenging to re-create. We encouraged the reviewers to use as many of the package's timesaving illustration features as possible. For instance, re-creating the tablecloth stressed the package's duplication functions, and the refraction effects in the bottle and the slight bump in the tablecloth in the upper right-hand corner made a good test of the product's warping and skewing facilities. The shadows, highlights, and woodgrain pattern effects thoroughly challenged color handling, especially the flexibility of gradient fills. Creating a label for the Arancia Spritzer bottle—a complex multistep task that involved coloring and special effects—helped the reviewers to evaluate the extent to which the software enhances or confines creativity.

The "Joe's Pizza" logo, a black-and-white TIFF image (designed by Beth Tondreau Design in New York) was autotraced, flipped, and placed in the window; we also imported the original bitmap and placed it in the page layout. The logo was especially designed to be a challenge to trace; the curves on the top of the *J*, for instance, are hairlines, and the oval around "Pizza" contains dramatic transitions from thick to thin.

To augment the autotrace testing, we traced the same logo; in this case, the background had several lines of various weights, which helped us to evaluate the autotracer's intelligence at handling the intersections between the logo and the lines. Finally, we evaluated the strength of the product's

text handling by importing an ASCII text file; we formatted it in a word-wrapped block on the page, using two supplied typefaces.

In creating this mock advertisement, we used many of the same techniques that technical illustrators use. In addition, we tested each package's ability to handle imported CAD images by importing a .DXF file of the pizza slice

(with dimensioning). The reviewers used their illustration packages to clean up the image, reformat the text, resize the image, and place it on the page.

While many of these tasks are important for technical illustrators, they're also the tasks that graphic designers use on a daily basis. We tried our best to push these packages to their limits. ■

Joe's Pizza: Old-fashioned Taste That Keeps Up with the Times



- Brooklyn, New York, since 1937
- Queens, New York, since 1944
- Great Neck, New York, since 1950
- Newark, New Jersey, since 1959
- Hoboken, New Jersey, since 1964
- Chicago, Illinois, since 1975
- Los Angeles, California, since 1975
- San Francisco, California, since 1975
- Houston, Texas, since 1975
- Philadelphia, Pennsylvania, since 1975
- Baltimore, Maryland, since 1975
- Seattle, Washington, since 1975
- Atlanta, Georgia, since 1975
- Orlando, Florida, since 1975
- Milwaukee, Wisconsin, since 1975
- Cincinnati, Ohio, since 1975
- Anaheim, California, since 1980
- Portland, Oregon, since 1982
- Burlington, Vermont, since 1983
- Westport, Connecticut, since 1985
- Southampton, New York, since 1987
- Beverly Hills, California, since 1989
- Aspen, Colorado, since 1990
- West Palm Beach, Florida, since 1990
- Honolulu, Hawaii, since 1991



Joe's Pizza has been around since 1937, and in 54 years our commitment to quality hasn't changed. We're proud that fresh, all-natural ingredients make our pizza taste homemade and old-fashioned. But times change, and so does pizza. A few years ago we switched to buffalo milk mozzarella—the flavor is wonderful, and it's low in fat. We

started our own herb farm and discovered that with fresh basil and oregano, the sauce didn't need as much salt. International markets and faster transportation methods mean that we can use the finest ingredients from around the world. Vine-ripened Israeli tomatoes, porcini mushrooms from Italy, and extra virgin olive oil from Greece make Joe's Pizza the gourmet's choice. Until now, if you wanted the best pizza available this side of the Atlantic, you had to visit one of our 25 pizzerias located nationwide. But now Joe's Pizzas are available fresh—in the refrigerated section of your grocery store. Drop by for a taste of our Marinara, Sausage and Mushroom, or Garden Vegetable pizzas today. And while you're in the store, try Joe's new line of all-natural spritzers. The Italianissimo flavors include Fragola (Strawberry), Mandorla (almond), and Arancia (orange).

This sample test page, which we created with *Designer*, consists of a complex illustration (duplicated from a photograph), large formatted text blocks, and an imported TIFF logo.

DIGITAL RESEARCH INC.

Digital Research Artline, Version 2.0

by Mark Wilson



If you're looking for a solidly built illustration package that does not require Windows, then consider Digital Research Artline. This \$595 program runs under GEM, which is Digital Research's own graphical environment, and unlike its Windows-based competitors, it runs with just 640K of RAM.

You can use Artline on an 8-MHz 286 machine, but as with its competitors, you'll get the best performance on a 386 machine with several megabytes of RAM. Even so, when drawings become complex, Artline's redraws become very slow. You can speed screen redraw times by toggling off colors and gradient fills, and also by using the layering feature to turn off any layers you're not using, thereby eliminating them from the redraw. Unfortunately, there is no function to terminate the current redraw.

Layering is particularly useful for managing complex drawings such as our test illustration; we used one layer for the window, another layer for the bottle, and so forth. The layer manager is also handy for creating progressively built slide presentations (you simply turn on the appro-

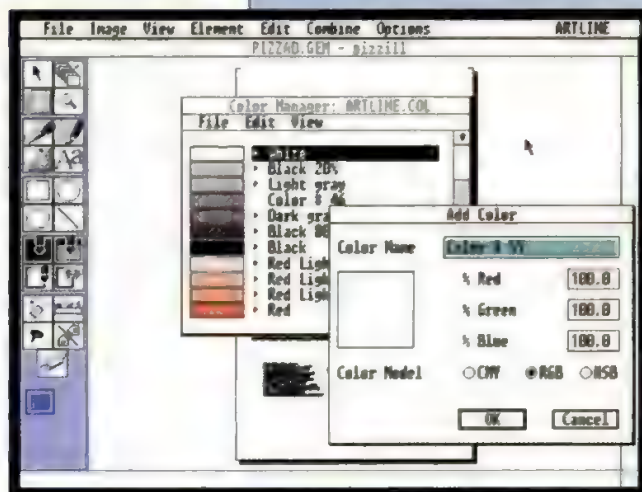
priate layer to display each additional element, and then you export the resulting image as a GEM or EPS file). And when used in combination with Artline's dimensioning capabilities, layering is a useful tool for technical illustrators as well. Cutting and pasting between the layers is simple and reliable.

Artline's user interface is straight-forward and easy to use. The program initially displays a toolbox of 21 icons (including commonly used tools such as circles, rectangles, and straight lines) on the left of the screen. These work pretty much as you would expect, though using the two curve tools (a freehand curve tool that converts your sketches into Bezier curves and a Bezier tool that you use to specify them directly) definitely takes practice and patience. The interactive capabilities of the icon toolbox are supplemented by pull-down menus that offer different ways of doing things. For example, you can scale a rectangle directly by choosing the selector tool, by using the pull-down menus to enter a percentage value, or by entering the amount to scale it on a pop-up slider.

The toolbox is customizable, however. You can rearrange the tool icons as you like, and you can also create tools from menu commands for instant access. For example, Rotate Grow—a sample custom tool supplied with the program—duplicates, rotates, and scales a selected object all at once. You can use custom tools to save a particular view of a drawing as an icon or to load custom palettes on demand. The tool editor is far from easy to use, so this function may not

GRAPHICS

ILLUSTRATION SOFTWARE



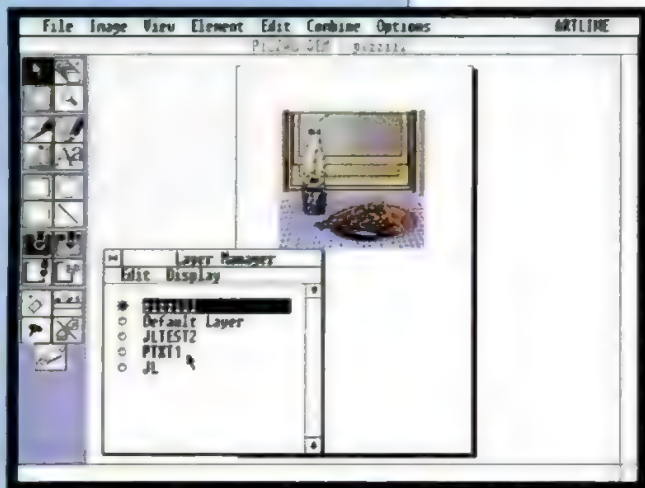
After you load any of 15 existing palettes into Digital Research Artline's color manager, you can easily configure them to your needs by adding colors and gradient fills.

appeal to the average user. But especially for highly repetitive and standardized drawing, it can be a great help.

LIMITED TEXT HANDLING

Artline handles text adequately but only in limited amounts. The package includes 45 fonts, and you can convert Bitstream or Adobe fonts into Artline's own .AF4 format. You can easily transform and color text, though you cannot get the fancy enveloping and perspective effects that *Arts and Letters Graphics Editor* and *CorelDRAW* support. Getting the text on-screen is another matter. Artline does not allow you to import text files; instead, you must enter text manually into a 4-line by 40-character text editing box. Since the fonts are described as series of vectors, if you have a fair amount of text in your drawing (as we did in our pizza ad), the redraws become extraordinarily slothful. Unfortunately, the program cannot determine the actual size of the font on-screen, so very small text takes as much time to draw as very large text.

Artline makes up for its text-handling deficiencies with good color support. It supports 1 billion colors, which you can use in any of three color models (CMY, RGB, or HSL), and its 700-color Pantone library is particularly impressive for the closeness of its color matches. You can load one of 15 existing palettes using the color manager, and you can freely customize these palettes by adding colors and



Digital Research Artline's layer manager can help speed redraw times on complex drawings. Here we've turned off the text layer, leaving behind only those layers currently in use.

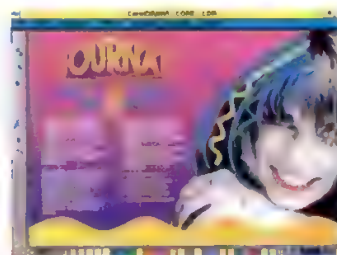
DO IT ALL

CORELDRAW!

"It's so easy to add flair!"

DO IT ► Desktop Publishing!

Your newsletter and ad are due today and to make them look great you need CorelDRAW! With 153 fonts, plus thousands of clipart images and symbols, creating dynamic headlines, diagrams, and logos is fast and easy!



DO IT ► Presentations!

Make a big impact with your presentation using CorelDRAW. Import and export with ease. Create slides, overheads, hand-outs or enhance on-line computer presentations.



DO IT ► For Fun!

Not only can you add flair to all your projects, you can create amazing illustrations, eye-catching greeting cards, invitations, certificates, and more. CorelDRAW's easy-to-use interface and incredible special effects let your imagination run wild!



See Us At COMDEX Booth #836 Sands Convention Center

For Windows, OS/2, UNIX. Now Available on CD-ROM!

Enter the \$1,000,000 CorelDRAW World Design Contest. Monthly Prizes!

COREL
TEL: (613) 728-8200
FAX: (613) 761-9176

CIRCLE 729 ON READER SERVICE CARD

ILLUSTRATION SOFTWARE: Performance Summary

Judging the performance of illustration packages is more an art than a science. Each of the four programs we reviewed uses different procedures to create and print drawings, and they suffer from different limitations. This results in significant variations in ease of creation and in raw printing times.

by Luisa Simone

Ultimately, the efficiency of a drawing package is measured by how easily the program allows you to accomplish the vision in your mind's eye. To measure these factors, we designed a performance test that encompasses all the elements going into the complex designs that people create—elements that affect productivity and performance.

Our test image consists of a 3-inch circle filled with a radial gradient and a phrase ("Draw And Design Software") wrapped around it. The text itself is drop-shadowed, and the entire wrapped text string is filled with a top-to-bottom linear gradient, as if it were a single object (the letters at the top of the circle are red, and the color changes gradually so that the letters at the bottom of the circle are yellow). We printed the test image while keeping the text in editable form, and we also converted the entire image to curves to see how that affected printing times.

Though this image can be described in just a few words, its complex clipping paths proved to be a challenge for all the packages. *CorelDRAW* proved most successful at the job of creating the image, generating all the elements with a minimum amount of hassle and consistently displaying the gradient-filled text string correctly. All the other programs required extra steps or design compromises to complete the image.

Designer, for instance, cannot fill a text object with a gradient pattern, so we had to use a solid fill instead (which explains this package's speedy printing scores when the text is still in editable form). When we converted the text to curves, we had to group the individual letters into a single object before applying the correct gradient.

Arts and Letters Graphics Editor had the opposite problem. It could duplicate the image with the correct gradient only by keeping the text in editable form. As soon as we converted the letters to curves, each letter was filled individu-

Using multiple complex special effects causes screen redraws to slow down considerably on all these packages. The only solution in most cases is to adjust the program's settings for better on-screen performance. All four packages let you work in wireframe mode, which is much faster than working on the fully rendered image. And you can sometimes enhance screen performance by reducing the number of bands in displayed gradient fills or by suppressing the display of bitmaps and pattern fills. Fortunately, every one of these programs lets you interrupt redraws, so you



Illustration-software test image

ally with the gradient, and we could find no way to group or otherwise join them into a single complex clipping path. *Digital Research Artline* also filled each letter in our test image individually, regardless of whether it was created as a text object or converted to curves; we could create the desired effect with *Artline* only by adding a rectangle with the correct gradient fill behind the text, and then using the text as a mask or cutout.

can continue working without having to stop and wait for the image to be completely re-rendered after every change.

PRINTING TIMES

After we used the packages to create the test image, we timed how long it took each one to print it. We generated both color and monochrome PostScript output and also printed the image in the HP LaserJet III's native PCL 5 mode. The

results are shown in the accompanying table.

Designer and *Artline*, which use proprietary PostScript printer drivers, had the fastest PostScript output times. Using *Artline*'s special PostScript printing command—which accesses the PostScript driver directly—gives a substantial performance boost. When printed using the Output selection with text converted to curves, the test image took 3 minutes 58 seconds to print—over 50 percent longer than it took when printed with the PostScript selection.

Designer's custom PostScript driver isn't just for speed. Though Micrografx claims that this driver's performance edge is significant on complex drawings, when printing our relatively simple test image it beat the standard *Windows* PostScript driver's timing by only about 10 percent. However, printing with the standard driver resulted in artifacts (the letters were connected), so you must use the Micrografx driver to get usable output. Also, you should not take *Designer*'s times at face value: The editable text version of the image printed quickly only because we could not use a

gradient fill on the text without converting it to curves; the solid fill that we used is much less processor-intensive.

CorelDRAW's times are also deceiving. It printed the test image with text converted to curves significantly faster than its competitors on the PacificPage PE PostScript cartridge. But this reflects the compromises we had to make to get it printed at all: With the curve quality set to the default of 1.0, *CorelDRAW* consistently bombed out the PostScript interpreter. To print the image, we were forced to reduce the curve quality dramatically (to 3.5 for the PacificPage cartridge and to 6.0 for the QMS ColorScript 100 Model 10 printer), which caused noticeable degradation in the image quality. At the time of our review, Corel Systems Corp. was working on a maintenance release (Version 2.01) that should address this problem; meanwhile, images with complex clipping paths require painful trade-offs in quality. (Fortunately, the image printed perfectly in text mode.)

Arts and Letters produced consistently high-quality printouts but at consistently slow speeds. The program's

ability to handle gradient fills—something new to Version 3.1—seems to be responsible for part of the performance hit. Moreover, *Arts and Letters* requires that you simultaneously keep in memory both the text and the irregular path to which it is aligned; in this case, the larger circle that serves as the path for the text wrap is hidden from view, but it is still present in the file. By contrast, *CorelDRAW* and *Designer* allow you to delete the path object after it has served its purpose.

All of the programs are capable of sending complex graphic images to non-PostScript printers. *CorelDRAW* and *Designer* had the fastest scores; as to quality, all three *Windows*-based programs produced superior printouts by using the latest *Windows* driver for the HP LaserJet III (Version 3.77). Digital Research should be shipping a driver for the LaserJet III by the time this review is published. In our tests, however, we were forced to use a LaserJet II driver, which produced muddy gradients that were much too dark.



TOP PERFORMANCE: CorelDRAW and Designer

HOW WE TESTED

Our testing platform was a Compaq Deskpro 386 25e with 8MB of RAM. We tested the *Windows* programs by using *Windows*' own SMARTDRV disk cache with a maximum size of 2MB and a minimum size of 1MB. *Digital Research Artline*, the only non-*Windows* program in our roundup, used an expanded memory manager set (Compaq's CEMM.EXE) on our tests in order to provide 2MB of expanded memory.

We printed the images twice, once with the text in editable form and once with the text and other objects converted to curves. For the color PostScript output, we used a QMS ColorScript 100 Model 10 with 5MB of memory. The monochrome PostScript output was generated using an HP LaserJet III equipped with a PacificPage PE PostScript cartridge and 5MB of memory. We generated the LaserJet III output on a printer with 5MB of memory. And in all cases, we turned off the *Windows* Print Manager for faster printing.

PERFORMANCE TIMES

(minutes:seconds)
Lower scores represent better performance

Arts and Letters Graphics Editor
Digital Research Artline
Designer
CorelDRAW

Editable Text

HP LaserJet III	PostScript	Color PostScript
1:41	4:15	4:25
1:19	3:04	2:38
1:07	1:16	1:44
0:56	3:26	3:01

Converted to Curves

HP LaserJet III	PostScript	Color PostScript
1:34	4:18	4:34
1:12	2:11	2:38
0:48	2:17	2:43
0:56	1:16	4:19

We generated *Artline*'s PostScript results by using that program's PostScript option rather than the GEM Output option; we used GEM's HP LaserJet II driver for its LaserJet results. For *Designer*'s PostScript results, we used the Micrografx PostScript driver. All other results are from standard *Windows* drivers.

customized gradient fills. Unfortunately, you will have to put up with a dithered display of all these colors; unlike its *Windows*-based counterparts, *Artline* can display only 16 colors on-screen. It doesn't support 256-color Super VGA modes, much less the true-color modes now emerging on the market.

The program supports a broad variety of output devices. PostScript printing is handled by a separate menu item, using a

special driver. The program can output to color and monochrome PostScript laser printers as well as HP LaserJets and HP PaintJets. *Artline* includes a utility to send *GEM* files directly to the MAGICorp slide service bureau for processing as 35-millimeter slides, color photo prints, transparencies, or color laser prints; registered users can obtain drivers for Matrix and

**Artline supports
a broad variety
of output devices
for color and black-
and-white printing,
as well as slides.**

Polaroid film recorders free of charge from Digital Research. But since *Artline* is not a *Windows* product, you won't benefit from the *Windows* drivers that are available with most other film recorders and speciality output devices.

RICH WITH A TWIST

Artline is rich in support for various file formats, but these are not straightforward in their implementation. The program's native format is its proprietary *GEM* vector format, but it also reads and writes editable EPS (.AI) files directly, and an HPGL driver (which you can use to export drawings in HPGL format) is available from Digital Research. For all other formats, you will have to rely on a customized version of Inset Systems' file conver-



Digital Research Artline, Version 2.0
Digital Research Inc., 70 Garden Court, Box DRI, Monterey, CA 93940; 408-982-0700.
List Price: \$595
Requires: 286-based PC or better; 640K RAM; 3.5MB hard disk space; EGA, VGA, or SVGA graphics adapter; DOS 3.1 or later; mouse

In Short: The only choice for the confirmed non-*Windows* user, *Artline* more than holds its own. It is notable for its well-implemented layering, customizable toolbox, and quick printing. But eschewing *Windows* requires tradeoffs in performance and on-screen color support.

CIRCLE 589 ON READER SERVICE CARD

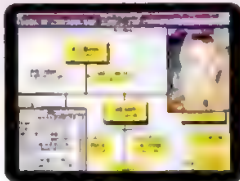
Instant ORGcharting!

The Organizational Chart Solution for Windows.

Instant ORGcharting! is the only Microsoft Windows program specifically designed to make, edit, and print organizational charts and tree diagrams. Easy to learn and even easier to use, you'll be creating professional looking charts in a fraction of the time required by other programs.

Just point and click to automatically create a perfectly spaced and aligned chart. Choose from a virtually unlimited combination of chart styles, fonts, colors, and patterns. You can even link employee pictures, attach notes to boxes, export to your favorite word processor and much more. And, as with all Roykore products, our free support Hotline is available if you ever need assistance.

To order, contact your local dealer. Or, for more information, free chart samples, or a demonstration disk, call us direct at 1-800-227-0847. No matter how basic or complex your organizational charting needs may be, *Instant ORGcharting!* can make your job simpler and more efficient. Retail price \$195.00.



Roykore
Drawing Tools for Business

1-800-227-0847

2215 Filbert Street, San Francisco, CA 94123
Phone (415) 563-9175 Fax: (415) 563-0836

Instant ORGcharting! is a trademark of Roykore, Inc. Microsoft and Windows are trademarks of Microsoft Corporation.

CIRCLE 476 ON READER SERVICE CARD

Trade up to
IRMAtrac and
save up to
\$445.



Sometimes you just need
a flexible board

IRMAtrac. The most flexible token-ring board in the world.

Within the myriad of connectivity options, you need to choose the path or paths that will protect your investment both now and in the future. Which is why we developed IRMAtrac,[™] our new, highly flexible token-ring board. IRMAtrac Token-Ring Adapter/Convertible is designed to adapt in three different ways, to cover all of the token-ring growth possibilities that face you.

Whether you're moving from shielded twisted pair to unshielded twisted pair, 4 to 16 Mbps, or the standard PC environment to the Micro Channel[®] world of PS/2,[®] IRMAtrac's flexible architecture handles all of these environments on the same board.

That way, you can select the path that's right for your business, all the while enjoying the kind of reliability and IBM[®]-compatibility that make DCA[®]'s IRMA[™] products so highly successful.



Yet our appeal doesn't stop at flexibility. IRMAtrac offers better performance due to on-board intelligence and bus-master technology.

And we're compatible with Novell[®] NetWare[®] 286 and 386, IBM PC LAN Program, Microsoft[®] LAN Manager, and others. We've even carried this flexibility to the Mac[®] with MacIRMAtrac[™]. And the RIMs are interchangeable between boards, giving you a single source for support and upgrades.

What's more, until Dec 31, 1991, you can trade up to IRMAtrac and get a credit of up to \$445 for your old coax or LAN adapters. For more information contact your DCA dealer or call 1-800-348-DCA-1, ext. 69A.

Now more than ever, it's the most flexible offer you'll find.

DCA



sion utility *HiJaak*, which comes bundled with every copy of *Artline*, to convert your files into GEM format. *HiJaak* is powerful and handles just about any vector or raster format around; unfortunately, it's a separate program with a separate—and clunky—user interface that you must call from the *Artline* menus.

The program's innovative autotracing function performs well in terms of speed and accuracy. Unlike its competitors, *Art-*

line is interactive; that is, you can stop and change settings in the middle of a trace. This is a helpful means of avoiding too much detail. You can first trace over simple parts of the image by using fairly loose settings that give you relatively few nodes; then you can shift to a more detailed setting when you come to complex image parts requiring lots of nodes for proper

Flowcharting as Simple as ABC.



See Us At
COMDEX, Microsoft
Booth—Free
Drawing Hourly

ABC Flowcharter for Microsoft Windows is the fastest, easiest, and most powerful PC flowcharting program available—which is probably why it's the #1 selling Windows flowcharting program.

Automatic shape sizing, line routing, and shape alignment let you create, edit, and print high-quality charts faster and easier than ever before. Simply move a shape, and *ABC Flowcharter* automatically reroutes the connections, as well as attached text. Choose from a full palette of colors, patterns, border styles and fonts. You can even link shapes to sub-charts for greater detail, attach notes for additional information, and much more. And, as with all Roykore products, our free support Hotline is available if you ever need assistance.

To order, contact your local dealer. Or, for more information, free chart samples, or a demonstration disk, call us at 1-800-227-0847. No matter how basic or complex your flowcharting needs may be, *ABC Flowcharter* will make your job simpler and more efficient. Retail price \$295.00.



Roykore™
Drawing Tools for Business

1-800-227-0847

2215 Filbert Street, San Francisco, CA 94123
Phone: (415) 563-9175 Fax: (415) 563-0836

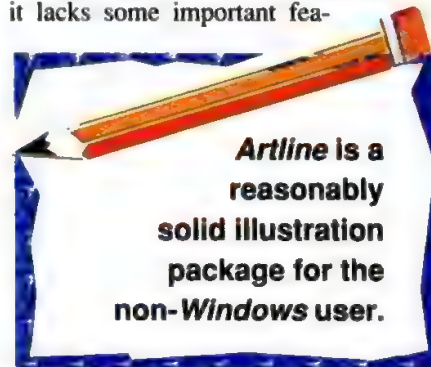
ABC Flowcharter is a trademark of Roykore, Inc. Microsoft and Windows are trademarks of Microsoft Corporation.

CIRCLE 124 ON READER SERVICE CARD



rendering. A sampler of about 200 pieces of clip art from 8 suppliers is included, with images ranging from mobile missile launchers to parrots.

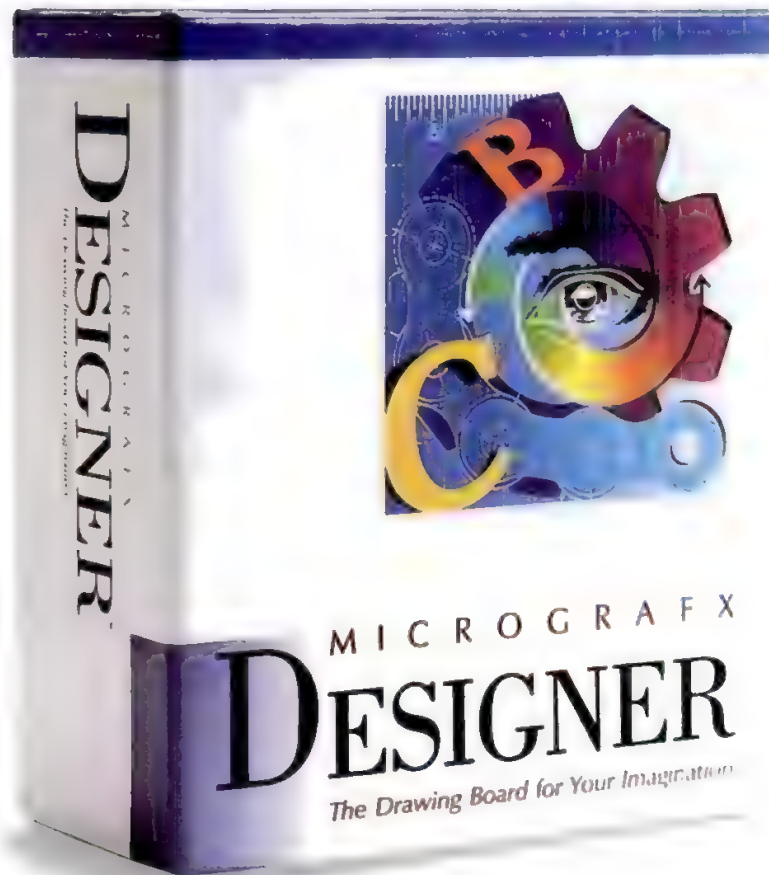
Artline is a reasonably solid illustration package for the non-Windows user. Though its performance is not the best and it lacks some important fea-



tures (notably full 256-color support and integrated file-import filters), its well-designed layer manager, customizable toolbox, and interruptible autotracing are features worth having. If you can afford to go to Windows, however, you'll do better in that environment. ■

Lori Grunin is a project leader at PC Magazine Labs. Kellyn Betts is a frequent contributor to PC Magazine. James Karney is a Tennessee-based consultant and writer on electronic publishing issues. He is the author of CorelDRAW Quick Reference, from Que Books. Paul Murphy is a partner in Singer-Murphy Associates, a New Jersey land-surveying firm. He is a sysop on PC MagNet and a frequent contributor to PC Magazine. Luisa Simone, a former executive editor of PC Magazine, is now a New York-based consultant and a contributing editor of the magazine. Mark Wilson is an artist who specializes in computer-generated fine art.

HEFTY HEFTY HEFTY



WIMPY WIMPY WIMPY



Want to play around? Get Corel Draw. But if your *work depends* on precision drawing, you should realize just how much more you can accomplish with Micrografx Designer."

Important things. Like putting up to 64 layers in your drawings. "Snapping" objects to align them perfectly. And editing drawings on the full screen, in color, instead of a wimpy black-and-white box.

"Designer is the power user's choice."
PC Magazine
"Editor's Choice"

Then there's Designer's poster-size 132" by 132" drawing area. Corel's is a mere 17" by 17" – leaving you to strip pieces together for larger drawings.

And don't forget clip art. Designer is

packed with over 1,700 ready-made illustrations. Corel, only 750.

If you have questions about using Designer, you can turn to help screens or our 24-hour telephone support. But you won't find any help screens in Corel Draw. And don't bother to call them after hours.

Features	Designer	Corel Draw
Drawing layers	64	1
Dimensioning	Yes	No
Object snap	Yes	No
Maximum drawing size	132" x 132"	17" x 17"
Edit in full color	Yes	No
Clip art images	Over 1,700	750
Named symbols	Yes	No
PageMaker 4.0 filter	Yes	No
On line help screens	Yes	No
24 hour support	Yes	No

The experts' verdict:
"No contest."

Software Digest gave Designer five stars to Corel's three, concluding: "Designer provides the best overall free-form graphics package. It offers state-of-the-art features, good performance, and unmatched ease of learning and use in a sophisticated package."

Why waste your time with a wimpy product when you can really flex your muscles with Designer? Call for the location of the dealer nearest you.

M I C R O G R A F X[®]
1-800-755-5940

Lotus opens Windows to a new dimension in spreadsheets!



Low Intro Price
\$99.99

Includes **FREE** Adobe Type Manager for Windows!

Lotus 1-2-3

The Windows version of the world's most popular spreadsheet

Upgrade to Lotus 1-2-3 for Windows

Save \$30! Now current users of Lotus 1-2-3 can step smoothly into the graphical environment of Windows 3.0 with a spreadsheet that delivers visual impact and presentation-quality output! Full compatibility with earlier versions ensures that all your files and macros transfer safely to Windows. Also features 3-D worksheets, a WYSIWYG work environment, a Solver tool for "what-if" problems, and SmartIcons for instant access to spreadsheet functions. To qualify for upgrade, just bring in the title page from your current version of Lotus 1-2-3. (Reg. Egg Upgrade Price will be \$129.99) For IBM from Lotus.

BONUS! FREE Adobe Type Manager for Windows is now built into every Lotus Windows application!

Also available, but not shown:

\$389.99

Lotus 1-2-3 for Windows (full-product version)

Save \$10! For IBM from Lotus. (Reg. Egg Price will be \$399.99)

\$99.99

Competitive "Upgrade" to Lotus 1-2-3 for Windows

Save \$50! Just bring in the title page of your current Borland Quattro Pro or Microsoft Excel spreadsheet, and switch to 1-2-3 for Windows for a special introductory price! (Reg. Egg Price will be \$129.99) For IBM from Lotus.

Lotus 1-2-3 for Windows/Ami Pro 2.0 for Windows Double Upgrade Bundle



Low Intro Price
\$159.99

Save \$50 either way you upgrade! Current 1-2-3 users can upgrade to Lotus 1-2-3 for Windows and also get Ami Pro Rel. 2.0 for Windows, the new, easy-to-use, "visual" word processor ideal for the creative professional, at this special price. And, current users of Ami, Ami Pro, Manuscript, or Samna Word IV can upgrade to Ami Pro Rel. 2.0 for Windows and get the new Lotus 1-2-3 for Windows at the same low bundle price. (Reg. Egg Bundle Price will be \$189.99) For IBM from Lotus.

Microsoft Windows 3.0/Logitech MouseMan Bundle

Save \$80! Buy Lotus 1-2-3 for Windows as part of any of these introductory offers and save on the Windows 3.0 graphical environment and a Logitech MouseMan. For IBM from Microsoft and Logitech.

Microsoft/Logitech Bundle	Reg. Egg Price	With purchase of Lotus 1-2-3 for Windows
Windows 3.0 and Serial MouseMan ...	\$199.99	\$119.99
Windows 3.0 and Bus MouseMan ...	\$209.99	\$129.99

Eggpress Ordering!



Contact your corporate account representative or visit your local Egghead store for these exceptional offers. Just call

1-800-EGGHEAD, Dept. #M1029, for the Egghead Discount Software store nearest you, or to order directly through our "Eggpress Ordering" service!

© 1991 Egghead Discount Software Inc. "Egghead," "Professor Egghead" and Egg words are trademarks of Egghead Discount Software. All other trademarked product and company names are the property of their respective trademark holders.

Discount
EGGHEAD SOFTWARE.
America's Software Eggsperts.

Prices shown are available at retail store locations and through 1-800-EGGHEAD in retail quantities only. Corporate discounts and payment terms do not apply to prices shown. Prices shown are in U.S. currency. Discounts taken from regular Egghead prices. Some intermediate mark-downs may have been taken. Sale prices are not good in combination with other special offers unless otherwise stated. Not responsible for typographical errors. Rainchecks are given unless advertisement clearly states that quantities are limited. Product availability may be affected by delays in shipping, however, we will always do our best to satisfy our customers. Sale prices and special offers good through 11/27/91.

by
Andrew Schulman

Lab Notes

For an intensely interactive environment such as *Microsoft Windows*, it surely ought to be easy to write programs that display information for and get input from the user. Paradoxically, however, input/output is notoriously the hardest part of *Windows* programming.

Fortunately, help is at hand. For writing simple *Windows* utilities you can use WordBASIC, the macro language in *Microsoft Word for Windows*. Going far beyond its role as the macro language for a word processor, WordBASIC provides full access to the entire *Windows* application program interface (API).

In the first part of this article (October 15, 1991), I showed how you can use the DECLARE statement in WordBASIC to create dynamic links to the *Windows* API, and how to use statements such as PRINT, MsgBox, and INSERT to display the results of calling various *Windows* functions. Here in Part 2, I'll cover the use of WordBASIC as a macro/batch language to launch and manipulate other applications. You'll also learn how to employ WordBASIC as a toolkit for working with dynamic data exchange (DDE), dialog boxes, and the *Windows* Graphics Device Interface (GDI).

SHELL AND SENDKEYS

It's often said that graphical user interface (GUI) systems such as *Windows* eliminate the need for batch commands and utilities. The truth, however, is that *Windows* multitasking *increases* the need for an easy way to start, send information to, and receive information from other tasks. Since WordBASIC can send messages to other applications and thus control them, it is eminently suitable for use as a batch, macro, or "job control" language for *Windows*.

The SHELL statement, which runs external programs, is the starting point for understanding how BASIC fits into *Windows* multitasking. SHELL is found in most BASIC dialects, of course, but in *Windows* it undergoes a remarkable trans-

A BASIC Approach to Programming in Windows, Part 2

■ WordBASIC routines can serve as the basis for the interactive control of *Windows* programs, and as an easy way to access DLLs and explore GDI statements.

formation. Normally, you expect a program to suspend itself while a second program, launched by SHELL, runs. For example, the description of the SHELL statement in the QuickBASIC documentation explains that it "exits the BASIC program, runs a .COM, .EXE, or .BAT program or a DOS command, and returns to the program at the line following the SHELL statement." But in the various BASICs available for *Windows*—including WordBASIC—when SHELL starts a .COM, .EXE, or .BAT program, the BASIC program continues to run.

The implications of this go far beyond just finishing up a task in the background. If a BASIC program can run at the same time as any external program it launches via SHELL, it means that BASIC can interact with those other applications while they're running.

A simple illustration of this ability is presented in Figure 1, which shows a WordBASIC subroutine that controls the *Windows* Notepad program. The user is asked for some text to send to Notepad and then uses the SHELL statement to launch Notepad, after which the Word-

BASIC SendKeys statement sends the keystrokes (including menu selections such as Alt-F A) to Notepad.

SendKeys pumps keystrokes into what the WordBASIC documentation calls the "active application." Since more than one application can be active in *Windows* at the same time, what this really means is that the keys go to whichever application holds the *Windows* "input focus." Conceptually, SendKeys is similar to Charles Petzold's famous *PC Magazine* utility KEY-FAKE, save that the SendKeys statement runs concurrently with the application whose input stream is being fooled.

SendKeys in WordBASIC is similar to the SEND.KEYS() macro in *Microsoft Excel*, even to the point of using the same syntax for describing keystrokes: ~ is Enter, % signals Alt-key combinations, + is for Shift, and ^ means Ctrl. Special keys are placed inside curly braces; {esc}, {numlock}, and {bksp}, for example.

Given its close connection with WordBASIC, it's not surprising that Visual Basic also supports the SendKeys statement. The same syntax is also employed by *Pubtech BatchWorks* (except that ! instead of % indicates Alt keys) and by the PUT command in *Bridge Tool Kit* (this time %% indicates Alt keys). The SendKeys syntax is a nearly universal standard within *Windows* macro languages.

Unfortunately, SendKeys does not work with DOS applications running under *Windows*. This is a limitation of the *Windows* implementation of the DOS box, not of WordBASIC. The PUT statement in *Bridge Tool Kit* is able to push keystrokes into a DOS application, for example, though this

Lab Notes

requires using the Bridge DOS Module (BRDOS) and the Bridge Message Controller (BRMSG). And it is also possible to use the *Windows* Device Driver Kit (DDK) to write a virtual device driver (VxD) that will put keystrokes into a DOS box in *Windows*' Enhanced mode.

HOW SENDKEYS IS IMPLEMENTED

Examining the way the SendKeys statement works reveals why the *Windows* environment is often called *message-based*. When programmers first encounter the *Windows* API, they're often puzzled to find that practically nothing happens without the sending of "messages." An example of this was presented in Figure 5 of Part 1. There, a hypothetical *Windows* application looked like nothing more than a passive recipient of WM_PAINTs, WM_CHARs, and other messages. A *Windows* application knows that a user has pressed a key, for example, only when it receives a WM_CHAR message.

The converse is also true: If an application receives a WM_CHAR message, it's just as if the user had hit a key! Thus,

implementing a statement like SendKeys is simple: You merely need to determine which window owns the input focus and then fire a stream of WM_CHAR (or WM_KEYDOWN) messages at that window. The window can't tell the difference between a faked WM_CHAR and a genuine keystroke, because the message is the medium.

Thus, messages—which at first may seem an arcane way of designating subroutine calls—turn out to be a key component of interprocess communications within the multiprocess *Windows* environment. Messages (such as SendKeys) provide the functionality to command and control other applications.

Simulating KEY-FAKE, the creation of which required a master assembly-language guru under character-mode MS-DOS, thus becomes a trivial matter under *Windows*. Figure 2 shows a simple implementation called MySendKeys, which I built using the GetFocus(), SendMessage(), and PostMessage() functions of the *Windows* API.

Unlike the genuine SendKeys statement, MySendKeys doesn't handle anything fancy—like the % Alt modifier or special cases such as {esc}. But that's only because I was lazy; if you want, you

can easily write a complete implementation of SendKeys in WordBASIC. (Handling the entire PC keyboard would require sending the scan code-based WM_KEYDOWN message rather than the ASCII character-based WM_CHAR message used in MySendKeys.) MySendKeys is also slower than the built-in SendKeys, but what do you expect from interpreted BASIC? A side benefit is that I could use the PRINT statement to watch the characters fly by on the status bar.

MySendKeys uses either SendMessage() or PostMessage() to deliver a series of WM_CHAR messages (one for each character in the string that is passed as its first parameter) to the window that has the input focus. As shown in Figure 2, which sends keystrokes from *Winword* to *Notepad*, this window can—and generally will—belong to another application. *Windows* cares only that you have a valid window handle (HWND); the fact that this handle corresponds to a window in another program is irrelevant. In MySendKeys, it's easy to get the HWND corresponding to the window with the input focus, thus:

```
Declare Function GetFocus \
    Lib "user" As Integer
    ...
    focus = GetFocus ' HWND
```

Once you've got the HWND, you can do practically anything you want with it. In MySendKeys, you post keys to it (or send them, if you want to wait for an acknowledgment). Just

```
Declare Sub PostMessage \
    Lib "user" (hWnd As Integer, \
    wParam As Integer, \
    lParam As Integer, lParam As Long)
    ...
    PostMessage focus, wmChar, c, 0
```

OTHER MESSAGES, OTHER WINDOWS

Sending keys to a window is simply one possible action. In a full-blown *Windows* batch language—*Bridge Tool Kit* or *Pubtech BatchWorks* and *Command Post* languages are examples: You can activate windows, move them, resize them, iconize them, change their title bars, and so on—just by sending them messages!

Figure 3 provides an example. Here, as previously, a few lines of WordBASIC code are used to force text into *Notepad*, but this time using the WM_SETTEXT message. WM_SETTEXT is also used to

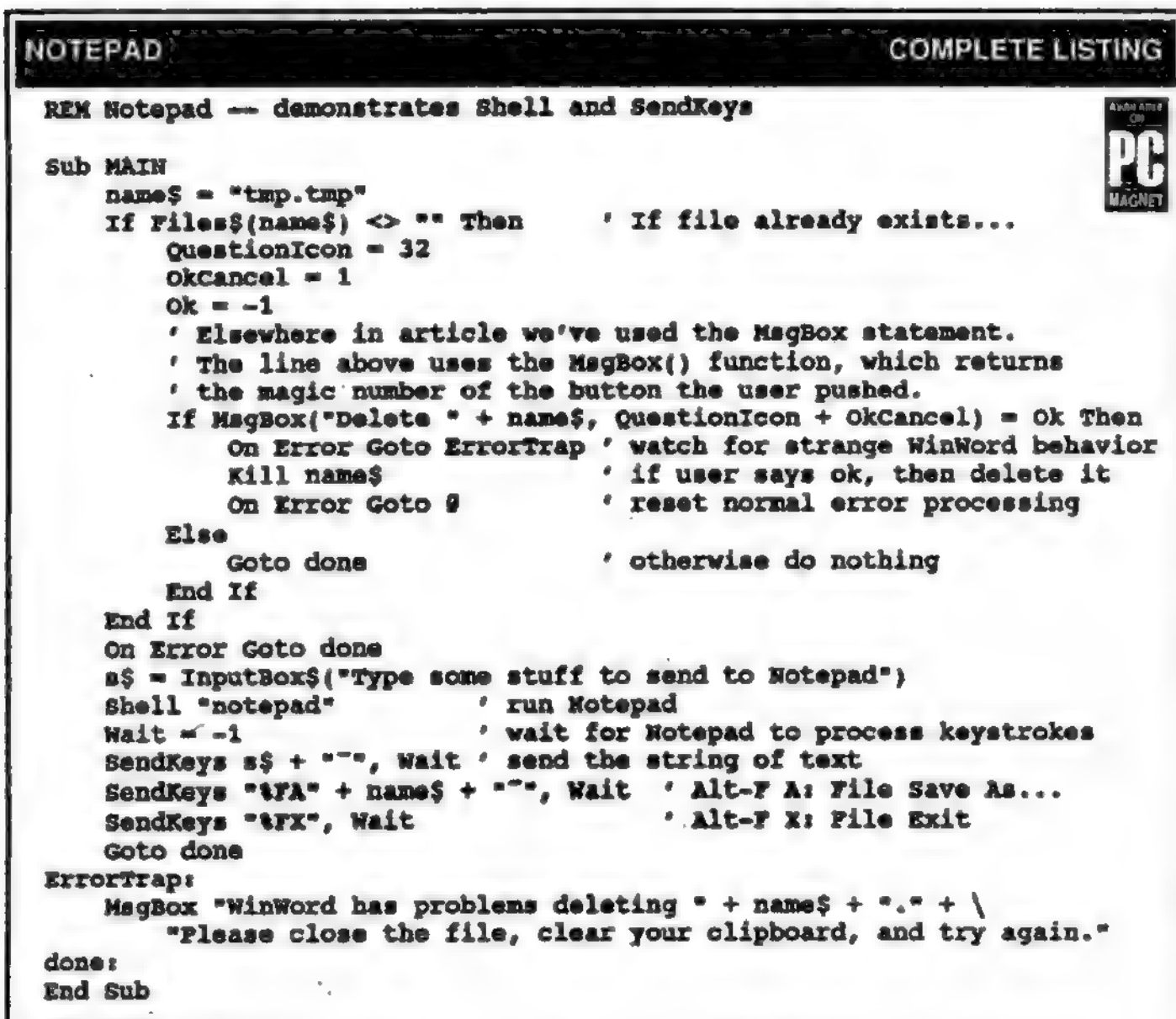


Figure 1: This simple WordBASIC subroutine demonstrates the use of the SHELL and SendKeys statements by opening Notepad and sending keystrokes to it.

Lab Notes

MYSENDKEYS **COMPLETE LISTING**

```
Declare Function GetFocus Lib "user" As Integer

Declare Sub PostMessage Lib "user" (hWnd As Integer, \
    wParam As Integer, lParam As Long)

Declare Sub SendMessage Lib "user" (hWnd As Integer, \
    wParam As Integer, lParam As Long)

Sub MySendKeys(keys$, wait)
    focus = GetFocus
    wParam = 258 ' WMCHAR is Windows message #258
    s$ = keys$
    While Len(s$) > 0
        ch$ = Left$(s$, 1) ' get next character
        s$ = Right$(s$, Len(s$) - 1) ' remove it
        If ch$ = "~" Then
            c = 13 ' {enter}
        Else
            c = Asc(ch$)
        End If
        Print c, s$ ' watch keys fly by on status bar
        If wait = 0 Then
            PostMessage focus, wParam, c, 0
        Else
            SendMessage focus, wParam, c, 0
        End If
    Wend
End Sub

Sub MAIN
    Shell "notepad"
    MySendKeys "this is a test of MySendKeys", 0
End Sub
```



Figure 2: The MySendKeys subroutine implements most of the messaging functions of SendKeys in WordBASIC.

change Notepad's titlebar. This WordBASIC subroutine uses the *Windows* FindWindow() API call to locate the main Notepad window and the GetFocus() function to find the multiline edit-control window into which one actually types in Notepad.

The only hard part in all this is getting an HWND in the first place; as we've seen, *Windows* lets you do what you want after that. As the listing in Figure 3 shows, the *Windows* FindWindow() API function can be used to turn window titles into HWNDs that can then be manipulated with functions such as SendMessage().

Note, however, that you must enter the window title exactly. Not "Notepad", but "Notepad - (untitled)" is the title bar for Notepad. *BatchWorks* and *Command Post* cleverly solve this problem by accepting partial window titles, using the *Windows* API functions EnumWindows() and EnumChildWindows() to find the closest match. This is an important feature to include in any satisfactory *Windows* batch language, because users generally need to be given the liberty of using approximate window titles to identify

specific applications.

Thus far, all of the examples of sending messages to other applications have used the WordBASIC SHELL statement to start up a copy of the recipient application. But what if the application is already running? SHELL will simply launch another copy (or "instance" in *Windows* jargon) of the same application, and this

is generally not what you want. How can a WordBASIC subroutine detect that an application is already loaded?

It's quite easy to build an IsAppLoaded() function, and this is actually the most popular use for the *Windows* API in WordBASIC. The optional Alias clause to the DECLARE statement lets you use *Windows* API functions while giving them names that are more meaningful in the context of *Winword*. To illustrate:

```
Declare Function IsAppLoaded \
    Lib "kernel" (name$) As Integer \
    Alias "GetModuleHandle"

Sub MAIN
    If IsAppLoaded("Notepad") = 0 Then
        Shell "notepad"
    Else
        Print "Notepad already running"
    End If
End Sub
```

HOW SHELL IS IMPLEMENTED

For all of its power to spawn concurrently running tasks that can then be manipulated from within BASIC, the SHELL statement, like SendKeys, would be quite easy to implement if Microsoft hadn't supplied it. The real wizardry lies in the *Windows* API WinExec() function. In fact, as you can see here, SHELL is really only a BASIC front end to this API function:

```
Declare Sub MyShell Lib "kernel" \
    (lpCmdStr$, nCmdShow \
    As Integer) \
    Alias "WinExec"

Sub MAIN
    MyShell "notepad", 1
End Sub
```

MYSHELL (1) **COMPLETE LISTING**

```
Declare Function FindWindow Lib "user" (dummy As Long, title$) \
    As Integer

Declare Function GetFocus Lib "user" As Integer

Declare Sub PostMessageStr Lib "user" (hWnd As Integer, \
    wParam As Integer, lParam As Long) Alias "PostMessage"

Sub MAIN
    Shell "notepad"
    notepad = FindWindow(0, "Notepad - (untitled)")
    editctrl = GetFocus
    wParam = 12
    PostMessageStr notepad, wParam, 0, "This is a test"
    PostMessageStr editctrl, wParam, 0, \
        "This is some text to appear in Notepad" + Chr$(13) + Chr$(10)
End Sub
```



Figure 3: As in Figure 1, this WordBASIC subroutine puts text into Notepad, this time using WM_SETTEXT.



Pretty.



*Mission Critical Workstation 1448.
9 option slots and 2 drive bays.*

A PC that looks good in your office won't look good for long out in the plant.

Heat murders microprocessors. Dust decimates disk drives. Vibration victimizes video cards.

Any or all can wreck your entire operation.

Texas Microsystems line of rugged, reliable ISA Bus products and systems are specifically engineered for those brutal industrial environments that eat pretty PCs for breakfast.

To ensure maximum reliability we design and manufacture from scratch practically everything that goes into our systems, like passive backplanes which we pioneered for microcomputers in 1983. These backplanes accommodate a full compliment of convenient, plug-in components, all compatible with IBM®. They're why our Mean Time To Repair (MTTR) is a phenomenal 10 minutes.

You won't find passive backplanes — or lower MTTR — in any of the leading office PCs.

We also build industrial-strength option cards to handle

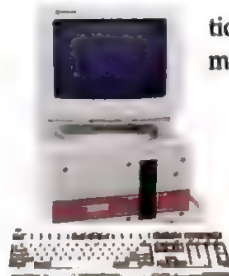
myriad functions, in addition to our 286, 386™ and 486™ CPU cards in a full range of processor speeds. Our CPU card designs use Very Large Scale Integrated circuits and programmable array logic devices to reduce component counts by 50-60% which enhances reliability and resistance to physical stress. Ultimately, the design contributes to our remarkably long Mean Time Between Failures (MTBF): 70,000-100,000 hours, calculated against the MIL Standard Handbook 217E.



*Ultra-fast 32-bit (80386) AT®
equivalent CPU board B386S
Available at 16, 20, 25, 33 MHz*

You won't find that kind of card selection — or MTBF — among the leading PC makers.

You won't find them torturing their systems like we torture ours, either. Not only do we perform extensive "shake, rattle and roll" tests on each new design, we pretest all our systems before they leave our dock. We burn them in at 55°C/131°F for 48 hours straight just to make sure they can take the heat at your plant.





Pretty Reliable.

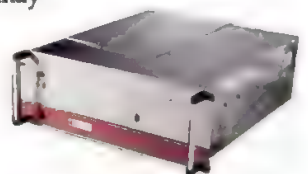
What's more, we shock-mount our disk drives to stand up to vibrations surpassing Richter scale proportions and we use only high-reliability power supplies that can go 100,000 hours MTBF.

With all that reliability designed into our products, is it any wonder that we guarantee better support than the other leading PC makers? Every system we offer comes with a full one-year, on-site warranty. Theirs don't. We also offer a toll-free number for technical and sales information, a regional network of sales engineers, engineering support for systems integration and a guarantee to meet shock specs. Of the lead-

ing PC makers, Texas Microsystems has the longest history of design using Intel microprocessors: 15 years in all. You'll find our systems hard at work in harsh operating environments at 70 of the Fortune 100 companies.

Granted, the leading office PCs may be prettier than ours, but our industrial-strength systems are designed to be more reliable. That reliability makes our systems look a lot better where it really counts:

Your production line.



*Mission Critical Rack-mount 2001
10 option slots and 3 drive bays.*

It's-No-Comparison			
	Texas Microsystems	COMPAQ	IBM PS/2
Passive Backplane	Yes	No	No
100,000-hour MTBF power supply	Yes	No	No
Shock-mounted disk drives	Yes	No	No
Maximized MTBF	Yes	No	No
Positive pressure, filtration	Yes	No	No
Operation at 55°C/131°F	Yes	No	No
48-hour burn-in at 55°C/131°F	Yes	No	No
Maximum expansion slots available	14	5	5
1-year, on-site warranty	Yes	No	No
Toll-free support number	Yes	No	No
Regional sales support	Yes	No	No
"Shake, rattle and roll" testing	Yes	No	No

For technical or sales information, call
1-800-627-8700



© 1990, Texas Microsystems, Inc. "Mission Critical Micro" is a trademark of Texas Microsystems, Inc. Other trademarks mentioned are registered, trademarked or service marked by their respective manufacturers.

CIRCLE 161 ON READER SERVICE CARD

Lab Notes

In addition to .COM, .EXE, and .BAT files, MyShell will properly handle .PIF files, since these are also handled by the WinExec() function

```
MyShell "command.pif"
```

As listed above, however, MyShell is not an exact replacement for the built-in SHELL statement. That's because SHELL is not restricted to launching files with .EXE, .COM, .BAT, or .PIF extensions. SHELL can also start applications that have been *associated* with specified file extensions. Thus

```
SHELL "foo.bmp"
```

might be used to initiate *PC Paintbrush* with foo.bmp as its object.

In this case, SHELL runs whatever application is designated in the *Windows* initialization file as the handler for *.BMP files. WIN.INI includes an [extensions] section that contains lines such as

TOOLBOOK

COMPLETE LISTING

```
Sub MAIN
  ChDir "c:\toolbook"
  Shell "tbook.exe", 0
  tbk = DDEInitiate("ToolBook", "System")
  ' ToolBook ignores startup minimize request
  SendKeys "% n", 1
  DDEExecute tbk, "draw a field from 0,0 to 1,1"
  On Error Goto done ' when user hits Cancel
  expr$ = ""
  While 1
    expr$ = InputBox$("OpenScript expression", \
      "ToolBookDDE", expr$)
    If Left$(expr$, 2) = "! " Then
      ' use ! for statements such as "set blah to blah"
      DDEExecute tbk, Right$(expr$, Len(expr$) - 2)
    Else
      DDEExecute tbk, "put " + expr$ + " into text of selection"
      retval$ = DDERequest$(tbk, "text of selection")
      MsgBox(expr$ + " = " + retval$, "Open Script return value")
    End If
  Wend
done:
  DDETerminate tbk
  AppActivate "Introducing ToolBook", 1 ' so we can close it
  SendKeys "{f4}" ' close
End Sub
```



Figure 5: This subroutine uses WordBASIC DDE statements to communicate with *ToolBook*.

```
[extensions]
; ...
bmp=pbrush.exe ^.bmp
```

WinExec() does not recognize such

"executable extensions"—the association, for example, of FOO.BMP with PBRUSH.EXE. And since the MyShell statement is merely an alias for WinExec(), it can't properly handle requests such as

```
MyShell "foo.bmp"
```

MYSHELL (2)

COMPLETE LISTING

```
REM MyShell2

Declare Sub MyShell Lib "kernel" \
  (lpCmdStr$, nCmdShow As Integer) \
  Alias "WinExec"

Function Extension$(fname$)
  If Len(fname$) < 4 Then maxi = Len(fname$) Else maxi = 4
  s$ = Right$(fname$, maxi) ' extension has to be in last characters
  If Instr(s$, "\") <> 0 Then ' must be tiny directory name, not extension
    Extension$ = ""
  Else
    n = Instr(s$, ".")
    If n = 0 Then Extension$ = "" Else \
      Extension$ = Right$(fname$, maxi - n)
  End If
End Function

Sub Launch(cmd$)
  If Instr(cmd$, " ") Then ' if space in cmd$, then
    MyShell cmd$, 1 ' must have program name already
  Else
    ext$ = Extension$(cmd$)
    prog$ = GetProfileString$("extensions", ext$) ' program.exe ^.xxx
    If prog$ = "" Then
      MyShell cmd$, 1 ' nothing in [extensions]: assume program name
    Else
      prog$ = Left$(prog$, Instr(prog$, " ")) ' throw away ^.xxx
      MyShell prog$ + " " + cmd$, 1
    End If
  End If
End Sub

Sub MAIN
  Launch "foo.bmp" ' or any filename .EXT.
End Sub
```



Figure 4: MYSELL2 is a refinement of MYSELL (Figure 3) that handles "Executable Extensions."

SHELL can perform the extra magic of examining the [extensions] statement of WIN.INI. Naturally, MyShell could do that too, using the WordBASIC GetProfileString\$() function. The only difficult part involves parsing a command to look for a file extension and parsing the profile string to get the program name. The code to do this is shown in Figure 4.

DDE

We have just seen that messaging gives applications the ability to affect each other in various ways. Still, shoving keys or text into another application is a pretty low-level form of interprocess communication. A multitasking environment such as *Windows* needs a higher-level way for applications to provide services to each other. This higher level is dynamic data exchange (DDE). An even higher level is Microsoft's Object Linking and Embedding (OLE).

DDE is a perfect example of why even experienced *Windows* developers need a tool like WordBASIC. Accessing DDE from C is notoriously difficult, fraught with confusing ACKs and atom tables. Microsoft itself has finally been persuaded

Lab Notes

to provide a cleaner set of DDE statements, in a dynamic link library called DDEML (see *PC Magazine*, May 14, 1991). But easy-to-use DDE statements and functions have been available for some time in WordBASIC.

To illustrate how easy it is to do DDE in WordBASIC, let's take one example. Some time ago I wanted to explore the OpenScript language in *ToolBook*, a runtime version of which was (then) included with every copy of *Windows*. If I couldn't really do any OpenScript from the runtime version, I at least wanted to see if I could access some subset of OpenScript by sending DDE messages to the runtime version of *ToolBook*. After giving up hope of writing a DDE application in C, I decided to give WordBASIC a try. Fifteen minutes later, I had a working program that used DDE to send OpenScript statements to *ToolBook*!

Figure 5 shows the resulting WordBASIC program. After firing up TBOOK.EXE, it uses the WordBASIC DDEInitiate() function to start a DDE conversation with *ToolBook* about the System topic. The program then goes into a loop that asks the user for OpenScript expressions, which are sent to *ToolBook*, using the WordBASIC DDEExecute statement. One OpenScript expression, for example, might be "the caption of this book." (OpenScript uses an English-like syntax akin to that of *HyperCard* on the Macintosh). The program uses the WordBASIC function DDERequest\$() to get

FILEOPEN **COMPLETE LISTING**

```

Sub MAIN
  On Error Goto done          ' in case user clicks Cancel
  Dim dlg As FileOpen         ' create a FileOpen dialog
  Dialog dlg                  ' show the dialog box
  ' We get back here when the user clicks Ok
  Print dlg.Name              ' .Name is the field we want
  ' for some reason, we forbid the user to open files whose
  ' name contains the string "phoo"
  If InStr(LCase$(dlg.Name), "phoo") = 0 Then
    FileOpen dlg.Name         ' run the FileOpen macro
  Else
    MsgBox "Authorization failure"
  End If
done:
End Sub

```

Figure 7: This code adds filtering to the File Open dialog box.

back the OpenScript return value, which it displays with MsgBox. When the user is finished, the program uses the DDETerminate statement to hang up the conversation and the SendKeys statement to force *ToolBook* to exit. (I could have exited at a higher level by using DDEExecute to send the OpenScript statement "send exit;".)

Note that the program also lets you enter OpenScript statements, such as "set the caption of this book to 'WordBASIC was here!'" To indicate imperatives (as opposed to queries), the program looks for an exclamation mark followed by a space as the first two characters. The result of one such command is shown in Figure 6, in which the runtime *ToolBook* title bar—"Introducing ToolBook"—is changed to "WordBASIC was here!" While this is hardly the world's most useful WordBASIC macro, it certainly lets you see DDE and multitasking in action.

Amid this discussion of multitasking in *Windows*, however, there is one anom-

aly about using *Winword*: You can't run multiple instances of *Winword* itself! A WordBASIC subroutine with the following statement

```
SHELL "winword"
```

merely produces the message "Word is already running."

It's also disconcerting to find that, given the superb support for outward-going DDE built into WordBASIC, the DDE command language that *Winword* itself can accept is not properly documented. Can another application send WordBASIC statements to *Winword* the same way that *Winword* can send OpenScript statements to *ToolBook*? If this seems a rather obvious feature to include, I at least have never been able to make it work.

DIALOG BOXES

In Part 1, I considered the problem of getting user input at the simplest level: The WordBASIC INPUT statement prompted for input in the *Winword* status bar. While this is appropriate for what I call an API calculator, it's certainly not the most elegant of user interfaces. And just as MsgBox produces nicer output than does the PRINT statement, so the WordBASIC InputBox\$() function is a bit more sophisticated than INPUT.

We saw in Part 1 that a still nicer form of output is provided by WordBASIC statements such as INSERT, which sends text to *Winword* documents. There is no precisely equivalent command for getting interactive input from a *Winword* document. However, the WordBASIC Selection\$() function will return a string (up to 32K) that contains whatever text within a document is selected. Moreover, the {fillin} field can use an input box to prompt a user from inside a document.

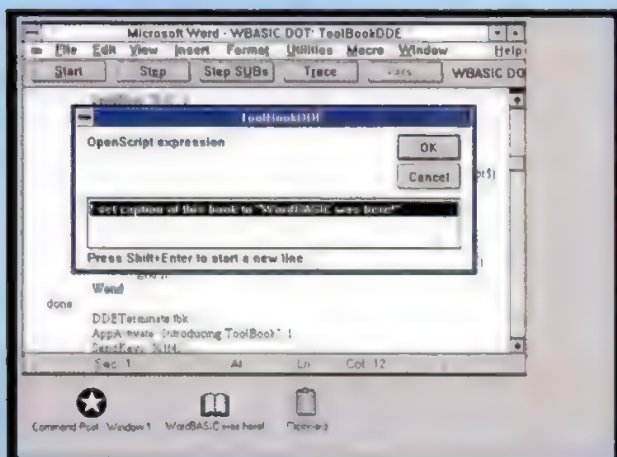


Figure 6: The routine shown in Figure 5 also permits you to change the *ToolBook* title bar.

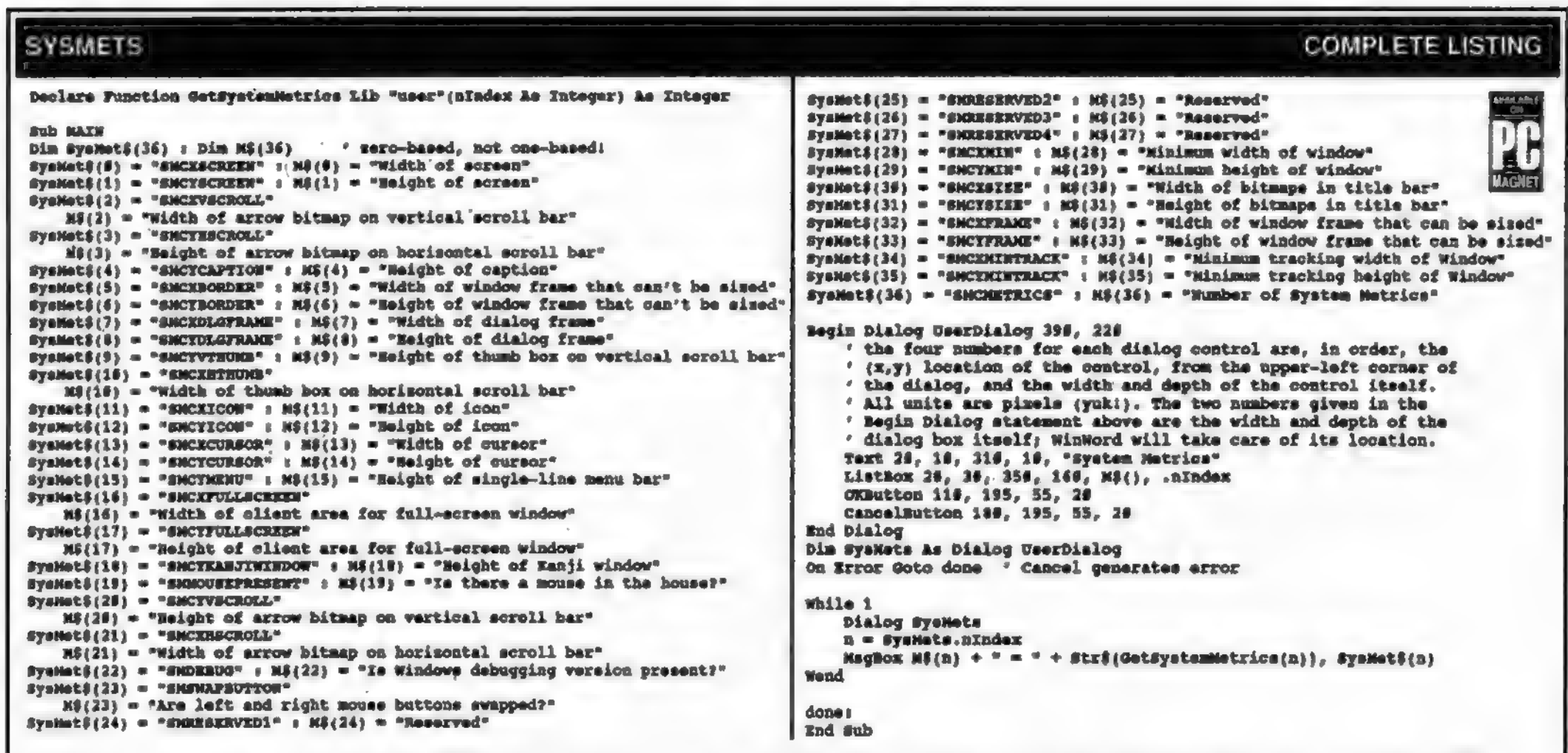


Figure 8: A dialog box, written in WordBASIC, that displays the *Windows* system metrics. The user-defined dialog box is created using WordBASIC statements such as `ListBox` and `OKButton`.

More important, however, there are dialog boxes. WordBASIC provides access to all the dialog boxes built into *Winword* and also makes it easy to create your own dialog boxes as part of a WordBASIC macro.

To adapt one of the standard *Winword* dialog boxes for use in your own WordBASIC program, you create a new dialog based on the existing structure. Note that in WordBASIC, the `DIM` (dimension) statement is used simply to reserve space for the dialog box and its fields; to display the box so the user can provide input, you use the `DIALOG` statement. After you have clicked OK, you retrieve values from the dialog box by accessing fields in the dialog structure.

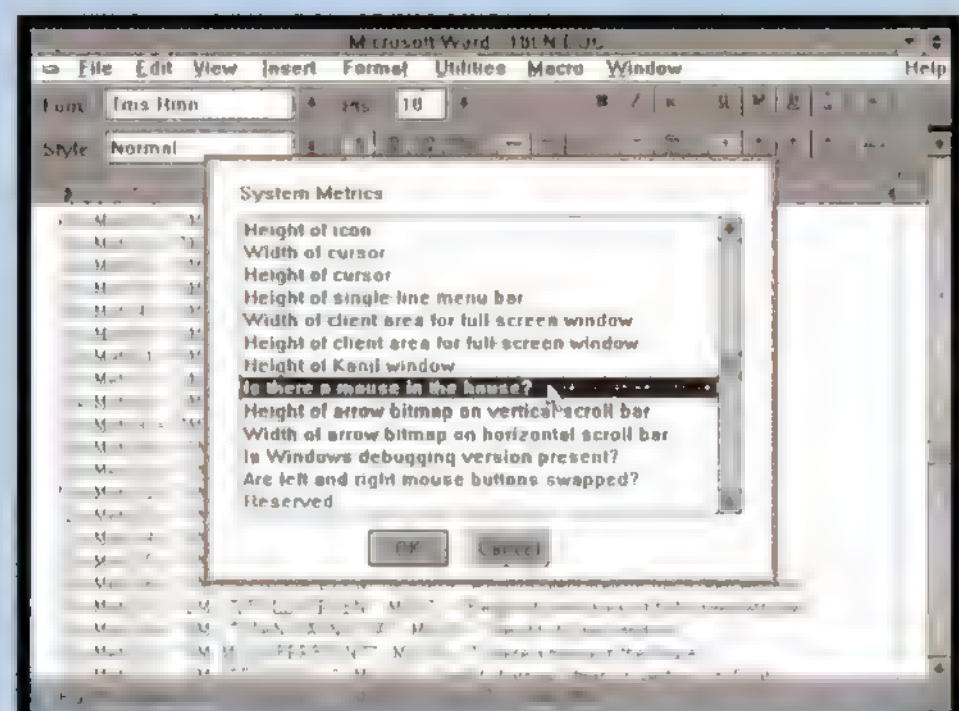
Since Microsoft's documentation for this process is inadequate, an example will provide at least a starting point. If you wanted to present the user with the *Winword* File Open... dialog box, yet perform some filtering on the chosen file before actually opening it, you would use code similar to that shown in Figure 7.

Displaying your own dialog box involves a similar process, except that instead of using built-in structures such as `FileOpen`, you must create your own. This is done right inside your WordBASIC program, not in a separate resource file, as it would be in a C program.

The first step in creating your own dialog box is to decide what it will look like: what sorts of controls it will contain (radio buttons, list boxes, or static text), where the controls are to be placed within the dialog box, what the controls will say, and so on. You then use a set of WordBASIC statements to describe the dialog box. The only difficult task here is to figure out the pixel location (with reference to the upper-left corner of the dialog box), the width, and the depth of each control.

A dialog structure starts with the statement `Begin Dialog UserDialog`. It then contains WordBASIC statements, such as `Text`, `ListBox`, `OKButton`, `CancelButton`, `ComboBox`, and so on, which indicate the various controls that make up the dialog box. Each statement takes a set of numbers describing the location and dimensions (in pixels) of the control. This structure definition is terminated with an `End Dialog` statement. At this point, you have a dialog-box "template" from which to create an actual dialog box by using

Figure 9: This was produced from the program shown in Figure 8. Note that the `ListBox` displays the names of all the *Windows* system metrics; that is, the widths and heights of various display elements in *Windows*.



GDI_GRAF	COMPLETE LISTING
<pre> Declare Function GetFocus Lib "user"() As Integer Declare Function GetDC Lib "user"(hWnd As Integer) As Integer Declare Sub ReleaseDC Lib "user"(hWnd As Integer, hDC As Integer) Declare Sub Rectangle Lib "gdi"(hDC As Integer, x1 As Integer, \ y1 As Integer, x2 As Integer, y2 As Integer) Declare Sub Ellipse Lib "gdi"(hDC As Integer, x1 As Integer, \ y1 As Integer, x2 As Integer, y2 As Integer) Declare Sub SelectObject Lib "gdi"(hDC As Integer, hObject As Integer) Declare Function GetActiveWindow Lib "user"() As Integer Declare Function GetSystemMetrics Lib "user"(nIndex As Integer) As Integer Declare Function CreateSolidBrush Lib "gdi"(rgb As Long) As Integer Declare Sub DeleteObject Lib "gdi"(h As Integer) Declare Function GetTickCount Lib "user"() As Long Sub Delay(milliseconds) t = GetTickCount t2 = t + milliseconds While t < t2 t = GetTickCount Wend End Sub Function RGB(r, g, b) r = Int(r) g = Int(g) b = Int(b) Print r, g, b </pre>	<pre> RGB = r + (g * 256) + (b * 256 * 256) End Function Function Rand(x) Rand = Int(Rnd() * x) End Function Sub MAIN ' too difficult to get client rect in WordBASIC! cx = GetSystemMetrics(8) cy = GetSystemMetrics(1) focus = GetFocus While 1 DisableInput 1 ' don't allow ESC while have DC hdc = GetDC(focus) hbrush = CreateSolidBrush(RGB(Rand(255), Rand(255), Rand(255))) SelectObject hdc, hbrush REM remove the REM from the following line if you want boxes too REM Rectangle hdc, Rand(cx), Rand(cy), Rand(cx), Rand(cy) Ellipse hdc, Rand(cx), Rand(cy), Rand(cx), Rand(cy) ReleaseDC focus, hdc DeleteObject hbrush DisableInput 0 ' reusable input Delay 500 ' delay 1/2 second Wend End Sub </pre>

Figure 10: The code for a simple graphics program that draws randomly colored ellipses of random sizes in random locations.

the DIM statement (as noted earlier). You display it with the DIALOG statement

```

** create dialog box template
Begin Dialog UserDialog x, y
    ListBox x1, y1, x2, y2, s$( ),
        .nIndex
    OkButton x1, y1, x2, y2
    ' ... other controls ...
End Dialog
** create dialog box
Dim SysMets As Dialog UserDialog
** show the dialog
Dialog SysMets

```

Figure 8 shows a sample WordBASIC subroutine, SYSMETS, that creates a system metrics browser; the resulting application is shown in Figure 9. The key field to note here is the ListBox; it displays the names of all the Windows System Metrics (these are widths and heights of various display elements in Windows). The ListBox is filled using a WordBASIC array of strings. It has been given a field name .nIndex, which is used to see which item the user has clicked:

```

** get results back from dialog
n = SysMets.nIndex
** display results
Print GetSystemMetrics(n)

```

From a program's point of view, a dialog box is just another way to get user input; the box fills the same role as an INPUT statement. To a user, however, a dialog box provides a much higher-level form of input than the rudimentary

INPUT statement or the InputBox\$() function.

WORDBASIC AND GDI

If dialog boxes provide a very sophisticated form of INPUT statement, graphics are a comparably refined version of PRINT.

Normal BASICs include many built-in graphics statements, such as PSET, LINE, and CIRCLE. QuickBASIC provides these in DOS, which has no underlying graphics services of its own. You would think, therefore, that such graphics statements would surely be provided in Windows, whose GDI supports a rich set of graphics services, such as SetPixel(), LineTo(), Rectangle(), and Ellipse().

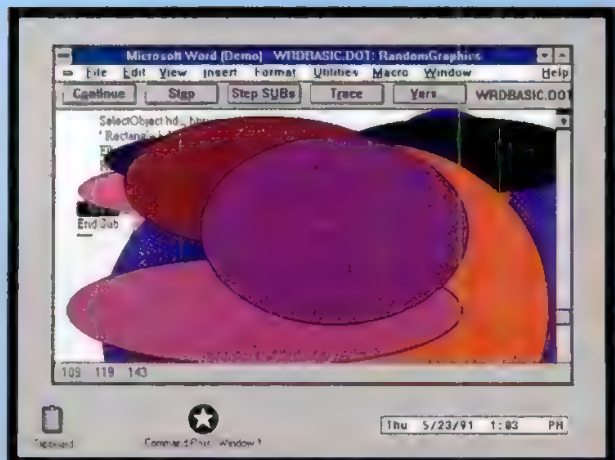
Unfortunately, you'd be wrong. Inexplicably, though Visual Basic and Micro-

soft BASIC for the Macintosh include such graphics statements, WordBASIC does not. Graphics can be imported into a Winword document (using the InsertPicture statement, for example), but they can't be generated within WordBASIC itself.

Since the goal here is to experiment with the Windows API, however, the lack of built-in BASIC graphics statements is not as serious as it might seem. What you'll probably want to do is access the actual GDI functions—like Ellipse()—directly, rather than use a higher-level BASIC statement like CIRCLE. And since WordBASIC's dynamic linking capabilities let you access any GDI function you want, it's almost as if WordBASIC did contain its own graphics capabilities.

To display graphics in a window with

Figure 11: Here we see the results of running the program listed in Figure 10. The RGB() function (in Figure 10) uses the PRINT statement to display the red-green-blue color values for each random ellipse.



FURTHER READING

by Andrew Schulman

If you'd like to explore these topics further, consider reading:

"Exploring Dynamic Data Exchange in Windows 3.0 with WordBASIC," Ray Duncan, *PC Magazine*, Power Programming, April 30, 1991.

A Hacker's Guide to the Univers: WinWord Tech Reference, Version 1.10a, Woody Leonhard (available in PC Mag-Net UTILFORUM, data library 10,

Windows, as HACKGD.ZIP).

Microsoft Word Technical Reference for Windows and OS/2, Redmond, Washington: Microsoft Press, 1990, 464 pp., ISBN 1-55615-290-6, \$22.95. (Make sure that you get the blue one, not the gray one!)

"Customizing Macros, Menus, and Templates in Word for Windows," M. David Stone, *PC Magazine*, Lab Notes, March 26, 1991. ■

GDI, you first need a handle (an `HWND`) to that window. Because there are numerous *Windows* API functions that return an `HWND`, there are all sorts of windows you can send graphics to; you don't have to use a window that you created yourself. From the `HWND`, you must then get a handle to a display context (an `HDC`). You can select various drawing objects (such as different-colored brushes) for the `HDC`, and then draw in it by using functions such as `Ellipse()` or `Rectangle()`. Note that when you're finished, you must "release" the `HDC`—GDI has only five of them, so they're a precious resource—and delete any objects you created.

The code for a simple graphics program (one that draws randomly colored ellipses of random sizes in random locations) is shown in Figure 10. The program goes through an endless cycle of `GetDC`, `CreateSolidBrush`, `SelectObject`, `Ellipse`, `ReleaseDC`, and `DeleteObject` calls until the user breaks out of the `WHILE 1/WEND` loop by pressing the Esc key. Note, however, that we can't allow a user to break out of the loop after we've called `GetDC` and before we've called `ReleaseDC`. This would lose a `DC`, which would probably crash *Windows* in the next few minutes! Therefore, the program uses the WordBASIC statement `DisableInput` in order to disable the Esc key between `GetDC` and `ReleaseDC`.

Because the permissible time interval during which you could hit Esc would otherwise be minuscule, the program includes the statement `Delay 500`. This adds a delay of 500 milliseconds (0.5 seconds). `Delay` is not part of WordBASIC, but it's easy to create such a statement.

The WordBASIC documentation (*Microsoft Word Technical Reference for Windows and OS/2*) tells you how to use the `For/Next` statement to write delay loops. This is unsatisfactory, however, because such loops are dependent on the speed of the computer and other factors.

Fortunately, since WordBASIC can access the *Windows* API, such poorly implemented delays are unnecessary. The `Delay` statement implemented in Figure 10 calls the *Windows* API function `GetTickCount()`, which is accurate to within ± 55 milliseconds. Note that *Winword* dispatches messages while executing WordBASIC statements, so other *Windows* applications will continue to run even while *Winword* is "stuck" inside this `Delay` statement.

There is an obvious difference between going directly to GDI, as we're doing in the random-graphics program in Figure 10, and using a high-level statement such as `CIRCLE`. The direct route requires you to attend to many more details. On the other hand, you can take many of these GDI calls and make them *look* like built-in BASIC statements. For example, in Figure 10 where there is a *Windows* API call whose return value will be ignored, it is `DECLARED` as a `SUB` rather than as a `FUNCTION`. This permits using a very natural BASIC-like syntax such as

```
ReleaseDC focus, hdc
```

rather than something like

```
retval = ReleaseDC(focus, hdc)
```

An additional benefit of accessing GDI

from WordBASIC is that GDI calls can be intermixed with the `PRINT` statement. The `RGB()` function in Figure 10 uses the `PRINT` statement to display the red-green-blue color values for each random ellipse; you can see the results in Figure 11.

LIMITATIONS

I noted earlier that WordBASIC's dynamic-linking access to GDI functions behaved almost as if WordBASIC possessed its own built-in graphics capabilities. The ability to create new statements, such as `ReleaseDC`, adds to this impression. Nonetheless, while WordBASIC provides a convenient method for exploring GDI, it is not useful for working with GDI—inserting graphics into a *Winword* document, for example.

The problem is that even though you can easily get GDI to display graphics on a window that holds a *Winword* document, *Winword* itself knows nothing about them. If you do anything that causes the window to be repainted—such as resizing it or moving another window on top of it—the graphics disappear. Even if you save the document, the graphics are ignored.

The reason for this is quite simple, and it tells us something about how *Windows* works. Output (graphics or text) in *Windows* is not persistent. Drawing a circle with `Ellipse()` or displaying text with the `TextOut()` API call does nothing to ensure that this output will stay where you put it. On the contrary, *Windows* programs must be capable of regenerating their display on demand; this is true of all event-driven GUI systems. *Windows* tells a window that it needs repainting by sending it a `WM_PAINT` message.

When you use BASIC statements such as `PRINT` or `INSERT`, the text stays put ("persists," to use the jargon), because *Winword* saves a copy of the output. A `WM_PAINT` handler inside *Winword* takes care of redisplaying this copy on demand. This is precisely why WordBASIC is so handy for displaying text in simple *Windows* programs: You can display text once and forget about having to keep it there. *Winword* does that for you automatically. But *Winword* can't store away any direct calls you make to GDI, for the simple reason that it doesn't know about them. If you remember, when you make GDI calls, you're doing an end-run around WordBASIC.

You can insert pictures into *Winword* documents by using either the `InsertPicture` statement or an `{import}` field. One

Lab Notes

of the supported picture types is the *Windows* Metafile (.WMF). Thus, you could write a WordBASIC program that opened a metafile with the GDI call `CreateMetaFile()`, write GDI calls into the metafile, and then import the metafile into a *Winword* document. That seems like an awful lot of work, however.

To work with GDI fully, BASIC would need either built-in graphics statements (such as `PSET`, `LINE`, or `CIRCLE`) or the ability to install user-defined event handlers. (The latter would let you take care of `WM_PAINT` yourself.) Fortunately, this has been done in Visual Basic, which provides both the BASIC graphics statements and the ability to install Paint handlers. Indeed, Visual Basic even adds an `AutoRedraw` option that automatically reconstructs an object whenever necessary.

SUMMING UP

One thing you should take away from this article is the realization that *Windows* programming, at least on an experimen-

tal level, does not have to be done in C. Many *Windows* operations, such as sending messages, getting window handles, and creating dialog templates, "map" very nicely onto a BASIC-like syntax.

You've also seen that the `PRINT` and `INPUT` statements, on which many of us cut our programming teeth, remain faithful allies, even when we're trying to learn how RGB color values are put together or how runtime dynamic linking works.

I hope, too, you will have gained some understanding of what goes on behind the scenes in *Windows*. All input arrives in the form of messages, so messages can be used to simulate input. Nothing that is displayed via GDI stays put, so you either need persistence or the ability to write a `WM_PAINT` handler. *Windows* is based on dynamic linking, so you can even link to new code while a program is running.

Many aspects of WordBASIC and *Winword*, such as templates, fields, and outlining, have not been explored here. *Winword* is a very rich product, and all of its features are available programmatically. If Microsoft were only to document the DDE syntax accepted by WordBASIC,

all this functionality could also be made available on demand to any other application running under *Windows*. One of the great promises of DDE is that it should be possible for applications to use each other essentially as subroutine libraries, with each providing services for what it does best. If this pans out, big applications like *Winword* will effectively become extensions to the operating system.

As it is, some of WordBASIC's strongest features—`SendKeys`, dynamic-linking `DECLARE`, and multitasking `SHELL`, for example—are really provided by *Windows* itself. In many ways, *Winword* is simply a typically good *Windows* application. If this is true, using software should be a little more enjoyable during the next few years. ■

Acknowledgment: WordBASIC guru Woody Leonhard made a number of crucial contributions to this article.

Andrew Schulman is an engineer and writer at Phar Lap Software in Cambridge, Massachusetts. Editor of the recently published Undocumented DOS, he also contributed to Ray Duncan's book Extending DOS.

Give Us Your Toughest Peripheral Sharing Problem

...or your simplest! Master Switch, the intelligent data switch from Rose Electronics, can handle it. The Master Switch series is so versatile and sophisticated, peripheral sharing becomes easy.

Anyone who appreciates ease-of-operation and technologically-advanced capabilities knows the Master Switch is the right choice...for sharing printers, plotters, modems, and any device with a serial or parallel port. Here's why:

- Any combination of serial or parallel ports
- Easy selection of peripherals
- User-expandable memory up to 4 megabytes
- Simultaneous access to all devices
- Rated 'fastest switch' by PC Magazine
- Advanced features include job queue, port contention, data collection, job control menu, initialization strings, pop-up menus, and many more
- Complete technical support; one-year warranty

The Low-Cost LAN Alternative
With our MasterNet software, the Master Switch provides many convenient LAN functions, such as E-mail, file transfer, and directory access.

Designed and manufactured in the USA. Field-proven in thousands of applications. The Master Switch answers any peripheral sharing challenge. Choose the intelligent data switch that handles your most complex needs, yet is easy to set up and operate... choose Master Switch.



ROSE
ELECTRONICS

(800) 333-9343

FAX (713) 933-0044 • (713) 933-7673
P.O. Box 742571 • Houston, Texas 77274
Call for complete information and our catalog of Switching and Sharing Solutions.
Dealer inquiries welcome.

THE FINE ART OF DISC DRIVES



Oil Painting by
Loran Speck
Carmel, California

When it comes to the SCSI interface, no

one has a more complete palette of disc drives than Seagate.

With capacities starting at 30 megabytes and escalating to 2.1 gigabytes, Seagate has a SCSI storage solution for every application. Form factors range from 3.5" low-profile for PCs and Macintoshes all the way up to 8" drives for mainframes and supercomputers. And they feature a variety of access times and price points to meet your specific requirements.

For more information on the classic SCSI disc drives using the latest technology, contact your authorized Seagate distributor. Or call Seagate at 800-468-DISC, or 408-438-6550.



Seagate

by
Gene Kavner

Utilities

Save Your Configuration Changes Without Leaving Windows 3.0

■ Our CFGSAVE utility saves you from having to leave *Windows* in order to save your current Program Manager configuration.

Would you like to be able to save changes to your current Program Manager configuration without closing all your running applications and exiting *Microsoft Windows*? As a reader in the December 25, 1990, *Windows* column suggested, you could start a standard DOS application and try to quit *Windows* while the DOS program is still running. If you check the Save Changes box when prompted, your new configuration will be saved when you say you want to exit. *Windows* won't complete its exit process, however, because the DOS application is still active. When it returns you to where you started, you can close the DOS program and continue on in *Windows*. But that's hardly intuitive.

Now there's a more elegant way: CFGSAVE. CFGSAVE is a standalone *Windows* 3.0 utility that attaches itself to the Program Manager by adding a Save Configuration item to the Program Manager's File menu.

When you select Save Configuration, the cursor becomes an hourglass for a couple of seconds while your configuration is saved. You remain in *Windows* during the entire operation, and none of your active *Windows* or DOS applications are affected. This one-step operation is so simple and straightforward that CFGSAVE will soon feel like a natural part of *Windows*.

You can download a ready-to-run copy of CFGSAVE from PC MagNet by following the instructions on the PC MagNet News page that immediately follows this article. If your communications setup cannot handle binary files, .BAS listings of the two required files (CFGSAVE.EXE and CFGSAVE.DLL) can be downloaded instead; running these in BASIC will recreate the .EXE and .DLL files automatically.

If you are interested in following the discussion in the Programmer's Notes section of this article, you should also download the source code and its associated files (MAKEFILE, SAVE.H, SAVE.C, SAVE.DEF, Savelib.C, Savelib.DEF from PC MagNet.) You can download all of these files together by choosing the ar-

chive file, CFGSAV.ZIP.

To recompile the program, you will need the *Windows* 3.0 Software Development Kit (SDK) and the Microsoft C compiler, Version 6.0. You must also ensure that the *Windows* SDK Include and library files are located in the directory pointed to by the INCLUDE and LIB environment variables, respectively.

Once all the necessary files are on your hard disk, you will be able to build the required executable (CFGSAVE.EXE) and the dynamic link library (CFGSAVE.DLL) simply by issuing the command NMK at the DOS prompt.

If you don't have a modem, you can get a copy of the source code by mail or fax. Simply send a postcard with your name and address (or fax number, if applicable) to the attention of Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; no phone calls, please.

INSTALLING AND USING CFGSAVE

CFGSAVE.EXE and CFGSAVE.DLL, the two files that make up the executable portion of the utility, should be copied into your *Windows* directory. You must then add CFGSAVE.EXE to the LOAD= line in the [Windows] section of your WIN.INI

file. (NOTEPAD.EXE or SYSEDIT.EXE are handy programs for editing WIN.INI.) This ensures that the utility will execute immediately after *Windows* is started. After you edit WIN.INI, it should appear as follows:

```
[Windows]
:
LOAD=CFGSAVE.EXE [other
applications]
:
:
```

When you restart *Windows*, there will be no visible difference in how the Program Manager and other applications are displayed, until you select the File item in the Program Manager's menu. When the pop-up menu is displayed, you'll see the new Save Configuration menu item, as shown in Figure 1. Now any time you make a change to the Program Manager, such as resizing or rearranging your group window, you can save your configuration simply by selecting Save Configuration from the Program Manager's menu.

Although CFGSAVE is an application separate from the *Windows* Program Manager, it does take advantage of certain Program Manager characteristics. It expects, for example, that during shutdown the Program Manager will display an Exit *Windows* dialog box prompting you to check the Save Changes box. It also expects that you will confirm your intention by pressing either the OK or Cancel button.

This utility was created for *Windows* 3.0. If run under any other version, the utility will terminate (after displaying an informative message box). However, if a

Utilities

future release of the Program Manager requires it, we will post a new version of CFGSAVE on PC MagNet.

UNDERSTANDING THE PROCESS

Before we address the technical aspects of CFGSAVE, let's try another method for saving your configuration without leaving *Windows*, using a *Windows* application instead. Let's suppose you have Notepad up and running and have just finished entering some text. To save your configuration you could:

(1) Switch to the Program Manager and double-click on its system menu to exit *Windows*.

(2) Make sure the Save Changes button is checked when the window shown in Figure 2 comes up, then press OK.

(3) Note that hard disk activity will occur, after which the dialog box shown in Figure 3 will appear.

(4) Press the CANCEL button.

(5) Close the Notepad by double-clicking in its system menu. The same Figure 3 dialog box will reappear. This time, press the No button, so the Notepad application terminates. You will notice that, as a result of this procedure, your Program Manager configuration has been saved.

Obviously, going through this rigmarole each time you want to save a new Program Manager configuration would be no improvement on the procedure of opening a DOS program and trying to quit while it is active. But the fact that you remained in *Windows* and did not have to start a DOS application means you can automate this procedure with a *Windows* application. That is the general principle upon which the CFGSAVE utility is based.

How? During step 3 above, you noted

Figure 1: CFGSAVE
adds a Save
Configuration option to
Windows' Program
Manager File menu.



some hard disk activity; that was the Program Manager saving its configuration. (You can double-check this by rebooting your machine when you're at step 4 and re-entering *Windows*. Any changes to the Program Manager made during the previous session will have taken effect.)

At step 4, then, after the configuration was saved, you had an opportunity to abort the exit completely. This was possible because it is *after* the Program Manager receives user confirmation to exit and save its configuration that it queries each running application for permission to terminate *Windows*. This provides each application with an opportunity to save any necessary data or perform any required maintenance operations.

Any individual application may refuse permission, in which case *Windows* will not terminate. Indeed, if permission to terminate *Windows* is denied by any application, none of the applications are terminated—including those that have already given permission to the Program Manager to quit *Windows*.

INSIDE THE EXIT PROCEDURE

When you double-click on the Program Manager's system menu, its window procedure receives a WM_CLOSE message. While processing this message, the Program Manager's window procedure displays its confirmatory Exit Windows dialog box. At this point, you also have an opportunity to check the Save Changes checkbox to indicate that the Program Manager's current configuration should be saved.

Pressing the CANCEL button causes the WM_COMMAND message, with the wParam parameter set to IDCANCEL, to be sent to the Exit Windows dialog procedure. The dialog procedure returns the code to the Program Manager's window procedure, telling it that you did not confirm *Windows* exit. The processing of WM_CLOSE is then terminated, and the window procedure exits.

On the other hand, if you press the OK button, the WM_COMMAND message, with wParam parameter set to IDOK, is sent to the Exit Windows dialog procedure. The dialog procedure then determines whether the Save Changes checkbox is checked. If so, it informs the Program Manager to save its configuration and exit *Windows*.

After saving its configuration, the Program Manager sends a WM_QUERYENDSESSION message to the top window of each application. If an application's window procedure returns a TRUE after processing this message, the Program Manager assumes the application has no problem with *Windows* terminating. The Program Manager then sends the WM_QUERYENDSESSION message to

IN-TEXT CODE: A Reminder

Several of you have written with questions about the code that appears within the text of Productivity columns. Here's a refresher:

Whenever a single line of code exceeds our magazine's column width, we break the line into two or more lines and place a tinted box over these lines. Single code lines that fit within our col-

umn width remain untinted.

In addition, the number of spaces a long line is indented indicates the number of spaces you should include when typing that multiple-line listing as a single-line entry. If a line is not indented, do not include any spaces.

We hope this clears up the confusion!—Ed.

PC MAGAZINE UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. You can get the modified versions by downloading them from PC MagNet. Here's a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ALIAS.COM, Version 1.1
ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.5
BCOPY, Version 1.2
BEN56.ARC (Benchmark Series, Version 5.6)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.3
CMDEDIT.EXE, Version 2.1
CONFIG.CTL, Version 3.0
CONVERT.COM, Version 1.1
DIRMATCH.COM, Version 2.0
EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
FILECTRL.COM, Version 1.1
LASERLST.COM, Version 1.1
LITES.COM, Version 1.1
LOG.COM, Version 1.1
MONO.COM, Version 1.1
MOUSE.CTL, Version 1.1
PANDORA.COM, Version 1.5a
PCACCESS.COM, Version 1.1
PCBOOK.EXE, Version 1.1

PCMANAGE.EXE, Version 1.1
PCREMOTE.COM, Version 1.1
RN.COM, Version 2.0
SCHEDULE.COM, Version 1.1
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

Please note that the *PC Magazine* utilities available on PC MagNet can be copied but are also copyrighted. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited.

CATALOG INFORMATION

Need to find the latest files? The Software and Utility Library (GO SOFT-LIB) provides three catalogs complete with filenames, locations, and brief descriptions of each listing. PCMCAT.ZIP is a complete list of all *PC Magazine* utilities and related files, including source code and documentation. Some recent favorites include: PRUNE.COM, PRISM.EXE, DR.COM, TED.COM, PCBOOK.EXE, the archived collections of HP LaserJet utilities (HPLSJT.ZIP), and file manager utilities (FILMAN.ZIP). UPDATE

.ZIP is a complete list of all programs which have been updated since their release.

SHWCAT.ZIP is a catalog of the high-quality freeware and shareware, including those mentioned in earlier issues. Some valuable tools include: PKZIP (PKZ110.EXE) and ARCE (ARCE.EXE) for archiving and extracting files, VDE text editor (VDE.ZIP), AsEasyAs spreadsheet (ASEASY.ZIP), and *Windows* icons (MGICON.ZIP). All catalogs may be easily printed with two *PC Magazine* HP LaserJet utilities: PCBOOK lets you create your own booklet, and LASERLST lets you print two pages on one piece of paper. If you prefer not to use paper at all, browse the catalogs with BROWSE.COM or WINSMOOTH (WSMOOT.ZIP).

A downloadable index to *PC Magazine*'s product reviews is also available. PCM.EXE is a self-extracting file containing the Computer Library *PC Magazine Reviews Index* for January 1988 to December 1990. To use PCM.EXE, you need the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

the next application.

If every application's top-level window procedure returns a TRUE, the Program Manager sends WM_ENDSESSION to each application, telling it that *Windows* is about to shut down. After each application has been so informed, the Program Manager destroys its own window, thus terminating *Windows*.

If an application's window procedure returns a FALSE after processing WM_QUERYENDSESSION, the Program Manager stops sending such messages and returns from processing the WM_CLOSE message without terminating *Windows*.

In designing CFGSAVE, I took advantage of the above process, which enabled the Program Manager configuration to be saved and yet prevented *Windows* from terminating.

CFGSAVE CONTROL FLOW

Now that you understand how the Program Manager behaves when you try to close *Windows*, let's turn to the CFGSAVE control flow. This is best described as a series of steps, to which we will subsequently refer when discussing the CFGSAVE implementation.

(1) CFGSAVE must obtain a handle to the Program Manager's menu and modify that menu by adding the new Save Configuration item to the File menu pop-up.

(2) CFGSAVE must then subclass the Program Manager's window procedure. This is done so that when the Save Configuration menu item is selected, it may be processed by the CFGSAVE utility rather than passed on to the Program Manager.

(3) When you select the Save Configuration menu item, CFGSAVE must filter all messages on a system-wide basis in or-

der to detect the WM_CREATE messages. In this way, CFGSAVE can detect the creation of the Exit Windows dialog box and the Save Changes checkbox after the WM_CLOSE message is sent to the Program Manager in step 4, below.

(4) CFGSAVE then sends a WM_CLOSE message to the Program Manager main window, simulating a user double-clicking on the Program Manager's system menu. This causes the Program Manager to create the Exit Windows dialog box.

(5) When the Exit Windows dialog box is created (though not yet displayed) it creates three controls: the Save Changes checkbox, the OK push button, and the CANCEL push button. After CFGSAVE detects (by means of the hook that is created in step 3) the creation of the Exit Windows dialog box, CFGSAVE must await creation of another window—the Save

Utilities

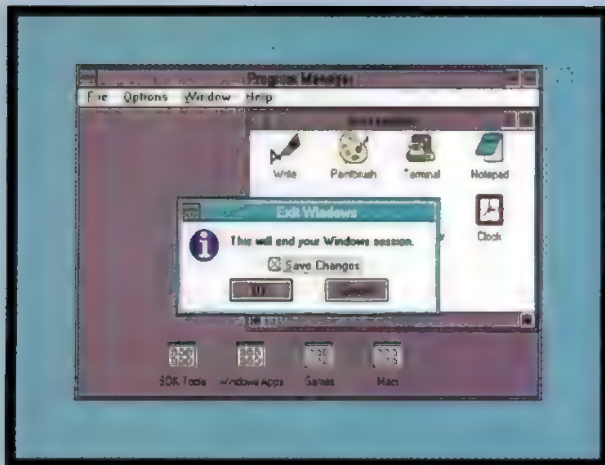


Figure 2: When CFGSAVE is operating, pressing OK here will save your configuration without making you leave *Windows*.

Changes checkbox.

(6) As soon as CFGSAVE detects creation of the Save Changes checkbox (again, with the hook created in step 3), CFGSAVE sends it a message that puts a check in the checkbox. This is accomplished before the Exit Windows dialog box or any of the controls inside the dialog box have been displayed.

(7) Since the Save Changes checkbox is now checked, CFGSAVE can safely send the IDOK message to the Exit Windows dialog box. This simulates you pressing the OK push button, causing the dialog box to close (before ever being displayed) and the Program Manager to save its configuration.

(8) Having now saved its configuration, the Program Manager proceeds to send WM_QUERYENDSESSION messages to each top-level window. Since the CFGSAVE application also has a top-level window, it will receive this message. The window procedure responds to the message with a NULL, and the *Windows* termination process is aborted.

(9) One other problem remains. Even though the CFGSAVE window procedure responds with a NULL to the WM_QUERYENDSESSION message, there is no way yet to guarantee that CFGSAVE will be the *first* application to get this message. If another application—such as an unsaved NOTEPAD—receives the WM_QUERYENDSESSION message first, it will display a dialog box like that shown in Figure 3.

Therefore, CFGSAVE must be made

the first application to receive the WM_QUERYENDSESSION message. This is again accomplished by hooking system-wide messages and waiting for the WM_QUERYENDSESSION message. When the hook routine put in place in step 3 detects such a message, it can modify the handle of the target window to CFGSAVE's window procedure. This guarantees that the very first WM_QUERYENDSESSION message that is sent by the Program Manager will result in a NULL return. When a NULL return is received by the Program Manager, the termination of *Windows* is automatically aborted and you are thrown back to where you were before you selected Save Configuration.

Figure 3: The disk activity just before this dialog box appears indicates that the Program Manager configuration is being saved.



Now that you understand the CFGSAVE control flow, let's take a look at the implementation of the CFGSAVE utility.

PROGRAMMER'S NOTES

The CFGSAVE source code is embodied in two files, SAVE.C and Savelib.C. The three modules in SAVE.C contain the source code to create the main executable part of the CFGSAVE utility. WinMain is the main entry point; besides creating a top-level window, it contains a message dispatch loop. SaveProc is the window callback procedure for the top-level window, and NewProgmanProc is the window procedure for the Program Manager window subclass. I will talk more about subclassing later.

The Savelib.C file contains the source code for the dynamic link library (DLL) that will be used by CFGSAVE to hook system-wide messages. Savelib.C also contains three modules. The SetMessageHook function is called by the main window procedure (NewProgmanProc) of the CFGSAVE utility to request the DLL to hook WM_CREATE and WM_QUERYENDSESSION messages. SendMessageProc is a callback function that intercepts (hooks) all system-wide messages. SendMessageProc is called by *Windows* when a message is sent to a window. The CancelMessageHook function is called by NewProgmanProc to tell the DLL to stop hooking system-wide messages.

STEP-BY-STEP IMPLEMENTATION

One of CFGSAVE's first tasks in the WinMain module is the creation of a top-level

HOW TO IMPLEMENT A DLL

by Gene Kavner

Implementing a DLL is a straightforward process under *Windows 3.0*. The files to be placed in the DLL must be linked separately from the files that comprise the application software, and they must have a separate definition module. Thus, you'll notice the `SAVELIB.DEF` module specifies

```
LIBRARY=savelib
```

while the `SAVE.DEF` module specifies

```
NAME=save
```

It is the `LIBRARY` keyword, instead of the `NAME` keyword, in the `SAVELIB.DEF` module that produces a DLL (rather than a *Windows* application) as the result of a link process. You will also notice that the DLL module definition file does not have a `STACK-SIZE` statement, as DLLs do not have their own stack and use the calling application's stack segment instead. If you're interested in learning more about the dynamic link libraries, you should refer to Chapter 20 in the *Guide to Programming* volume of the *Windows 3.0 SDK*. ■

window. This ensures that at least one top-level window will be available to receive the `WM_QUERYENDSESSION` message dispatched by the Program Manager after receiving the `WM_CLOSE` request. Since this window will not actually display anything, it is not made visible. Thus, the name of the application does not appear in the *Windows* task list.

Next, `CFGSAVE` must modify the Program Manager's menu (control flow step 1), which requires getting a handle for that menu. This is accomplished in the callback routine (`SaveProc`) of the window just created. Since *Windows* sends the `WM_CREATE` message to the window as one of the initial messages, the modification of the Program Manager's menu can be accomplished when `WM_CREATE` is received. In order for `CFGSAVE` to obtain a handle to the Program Manager's menu, it will need a handle to the Program Manager's window. Thus:

```
/* obtain handle to the Program
Manager window */
hProgMan =
FindWindow(NULL, "Program Manager");
```

OBTAINING THE MENU HANDLE

Now that we have a handle to the Program Manager's window, we can obtain the handle to its File pop-up menu, where the Save Configuration menu item is to be placed. To do this, however, we must first obtain the handle to the Program Manager's main menu:

```
/* obtain handle to Program
Manager's menu */
hMainMenu = GetMenu (hProgMan);
```

We can now get the handle to the File pop-up menu:

```
/* get handle to a 'File'
pop-up */
hSubMenu =
GetSubMenu (hMainMenu, 0);
```

Here, we took advantage of the fact that the File pop-up is the first menu item in the Program Manager's top menu (item 0). The second parameter to the `GetSubMenu` API call is, therefore, 0.

Having obtained the handle to the File pop-up menu, we can now easily insert the Save Configuration menu item and the separator bar (the horizontal bar between the Properties . . . and Save Configuration menu items) in their proper positions, like this:

```
InsertMenu(hSubMenu, 6,
MF_BYPOSITION | MF_ENABLED,
ID_SAVE, "Save Configuration");

InsertMenu(hSubMenu, 6,
MF_BYPOSITION | MF_ENABLED |
MF_SEPARATOR, NULL, NULL);
```

Note that the fourth parameter of the first call to `InsertMenu()` API. `ID_SAVE` is #defined in the file `SAVE.H` as having the value 0x555 (555 hexadecimal). This ID will be sent to the Program Manager's

window procedure when the Save Configuration menu item is selected, and it must therefore be different from the ID value of any other menu item in the Program Manager's menu. (To find such a unique ID value, I used the *SPY* application supplied and documented in the *Windows SDK* to examine the values assigned to the ID's of all other menu items.)

SUBCLASSING PROGMAN'S WINDOWS

The *Windows 3.0 SDK* provides a method for writing applications that intercept messages destined for windows owned by other applications. The method examines them, performs any necessary actions, and then decides whether or not to forward the messages to the original destination window. This method is called *subclassing*, and `CFGSAVE` uses it to detect when a user selects the Save Configuration item from the Program Manager menu.

The code excerpt in Figure 4 shows how `CFGSAVE` implements the subclassing of the Program Manager's main window (control flow step 2). Once the Program Manager's window is subclassed, all messages destined for it will go through the `NewProgmanProc()` procedure first.

The only message this procedure must handle is the indication that the user selected the Save Configuration menu item. All other messages will be safely forwarded by the `NewProgmanProc()` procedure in the original Program Manager window procedure.

When a user selects the Save Configuration menu item, `NewProgmanProc()` receives a message, with the `msg` parameter set to `WM_COMMAND` and `wParam` parameter set to `ID_SAVE`. Once the message is received, `NewProgmanProc()` must initiate the hooking of all `WM_CREATE` messages (control flow step 3) and send a `WM_CLOSE` message to the Program Manager (control flow step 4). The reason `CFGSAVE` must hook all `WM_CREATE` messages is so it can detect the creation of the Exit Windows window, which the Program Manager creates when it receives the `WM_CLOSE` message.

HOOKING WM_CREATE MESSAGES

`CFGSAVE` must detect when the Exit Windows window is created, both to ensure that the Save Changes box is checked and to simulate the pressing of the OK button by the user.

To detect the creation of a window, `CFGSAVE` must hook into the system-wide message dispatch mechanism and ex-

Utilities

amine all WM_CREATE messages. This is accomplished by setting a *Windows 3.0* hook, thus:

```
lpPrevSendMsgProc =  
SetWindowsHook(WH_CALLWNDPROC,  
(FARPROC)SendMessageProc);
```

As a result of this call, the `SendMessageProc()` procedure (located in `SAVELIB.C`) will receive all system-wide messages sent via the `SendMessage()` API. The reason for resorting to system-wide hooking (as opposed to using subclassing) in this situation is that the window whose messages we would like to intercept has not yet been created.

According to the description in the *SDK Reference Manual*, we must place the `SetWindowsHook()` call in a dynamic link library (DLL). (See section 20.2.3 of the *Guide to Programming* volume of the *Windows 3.0 SDK*.) Thus the `SetWindowsHook()` procedure is located in `SAVELIB.C`.

The `SendMessageProc()` procedure must detect the creation of two windows: the Exit Windows window and then the Save Changes checkbox. When the first WM_CREATE message is received, `SendMessageProc()` determines whether the Exit Windows window is being created. Thus:

```
/* if Exit Windows window hasn't  
been detected yet, check if  
this is it */  
  
if (hwndExit Windows)  
{hwndExitWindows =  
FindWindow(NULL, "Exit Windows");}
```

If this is not the first WM_CREATE mes-

sage processed and the Exit Windows window has already been created, `SendMessageProc()` must determine whether this is the Save Changes checkbox (control flow step 5). Thus:

```
/* if Exit Windows window does  
exist, determine if Save Changes  
checkbox control is being created  
(its ID is 111 decimal) */  
  
else if  
(GetDlgItem(hwndExitWindows,  
111)==lParam->hwnd) {  
/* if this is Save Changes  
checkbox, check it and simulate  
user pressing the OK button */  
  
PostMessage(lParam->hwnd,  
BM_SETCHECK, 1, NULL);  
  
PostMessage(hwndExitWindows,  
WM_COMMAND, IDOK, NULL); }
```

A little experimentation shows that 111 (decimal) is the ID value of the Save Changes checkbox control. That value in the call to `GetDlgItem()` API determines if the Save Changes checkbox is the window being created.

Having determined that the Save Changes checkbox is being created, the `SendMessageProc()` procedure ensures that it is checked by posting a `BM_SETCHECK` message to the checkbox (control flow step 6).

Note that the `PostMessage()` API must be used instead of the `SendMessage()` API. The reason for this is that `SendMessage()` would attempt to deliver the `BM_SETCHECK` message immediately to the control that is in the process of being created and, therefore, would not succeed. `PostMessage()`, on the other hand, will wait until the processing of the WM_CREATE message is complete before delivering the message.

Once the Save Changes checkbox is

checked, `SendMessageProc()` must simulate a user pressing the OK push button (control flow step 7). This is accomplished by posting the `WM_COMMAND` message to the Exit Windows window, as shown earlier.

By issuing these commands during the processing of the WM_CREATE messages, `CFGSAVE` ensures that the Save Changes checkbox is checked and the OK push button is pushed before the Exit Windows window is displayed. By pressing the OK push button during the processing of the WM_CREATE messages, `CFGSAVE` ensures that the Exit Windows window will not appear.

WM_QUERYENDSESSION PROCESSING

As discussed earlier, checking the Save Changes checkbox and pressing the OK push button in the Exit Windows window will cause the Program Manager to save its configuration. After saving the configuration, the Program Manager sends a `WM_QUERYENDSESSION` message to the top-level window of every application.

To abort the exit from *Windows* (control flow step 8), `CFGSAVE` must make sure that its top-level window responds with a NULL to the `WM_QUERYENDSESSION`. Thus:

```
case WM_QUERYENDSESSION:  
if (fGlobalState ==  
INTERCEPT_QUERYENDSESSION) {  
return NULL;  
}  
else {  
return TRUE;  
}  
break;
```

In this code excerpt, there is a check of a global `fGlobalState` variable. This is to make sure that `CFGSAVE` responds with a NULL to the `WM_QUERYENDSESSION` message only when it is responding to the user's selection of the Save Configuration menu item and not at any other time. If `CFGSAVE` responded with a NULL at any other time, *Windows* would never be able to terminate!

HOOKING WM_QUERYENDSESSION

Finally, `CFGSAVE` must ensure that it is the first application to receive the `WM_QUERYENDSESSION` message (control flow step 9). This again requires hooking system-wide messages. As soon as the first `WM_QUERYENDSESSION` message is sent by the Program Manager,

SAVE.C	PARTIAL LISTING
<pre>/* produce a pointer to this application's instance of the New Program Manager procedure */ if (!lpProgmanProc = MakeProcInstance((FARPROC)NewProgmanProc, hGlobalInstance)) { MessageBeep(NULL); break; } /* obtain a pointer to the Program Manager's current window procedure */ lpOldProgmanProc = (FARPROC) GetWindowLong (hProgMan, GWL_WNDPROC); /* modify Program Manager's window procedure */ SetWindowLong (hProgMan, GWL_WNDPROC, (LONG) lpProgmanProc);</pre>	

Figure 4: `CFGSAVE` modifies the normal Program Manager's window procedure to accommodate the new Save Configuration item.

Utilities

it must be diverted by the CFGSAVE hook, SendMessageProc(), to the top-level window procedure of the CFGSAVE utility. Thus:

```
/* if this is WM_QUERYENDSESSION
message divert it to the CFGSAVE
top-level window */
if (lParam->wMsg ==
WM_QUERYENDSESSION) {
lParam->hwnd=hwndTop;
DefHookProc(nCode, wParam,
(LONG)lParam,
(FARPROC FAR*)&lpPrevSendMsgProc);
return;
}
```

This ensures that the first WM_QUERY-
ENDSESSION message the Program
Manager sends will be returned with a
NULL, and Windows' exit will be
successfully aborted.

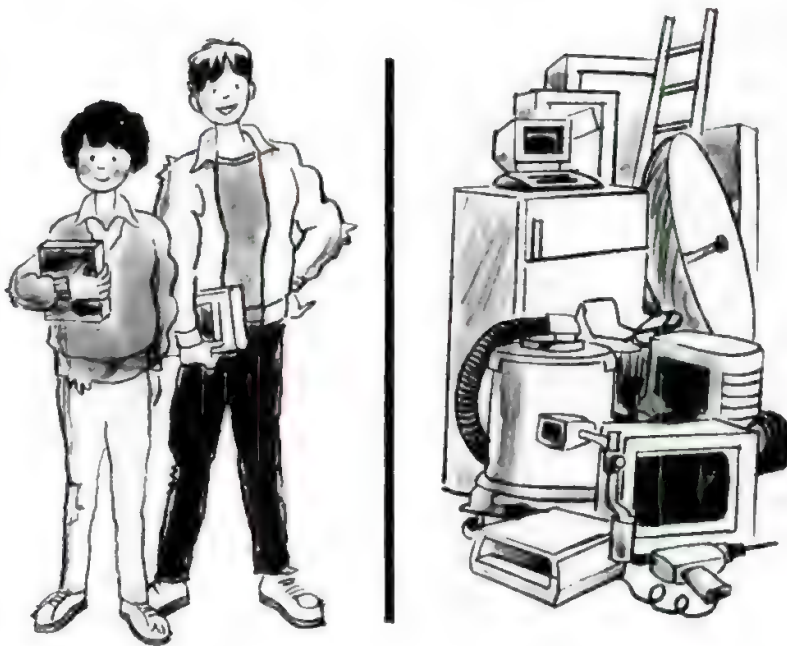
PROGRAMMING SUGGESTIONS

The Windows 3.0 SDK allows you to alter the behavior of other applications by modifying their menus, by subclassing their window procedures, and by hooking and modifying system-wide messages. CFGSAVE illustrates all these capabilities. However, remember that making such modifications will affect the look and feel of those applications and of the overall Windows environment. Moreover, if you're not careful, you may introduce unexpected system crashes when running those applications.

Once you have mastered the capabilities of the Windows 3.0 SDK, however, you will be able to develop some very powerful utilities. Here are a few ideas you might wish to implement: Figure out a way to prevent Windows users from ever exiting Windows; remove potentially destructive operations of the File Manager, such as deleting, moving, or renaming files and directories; prevent users from viewing hidden files with the File Manager; and add new features to applications by placing additional items in their menus. In addition, if you're feeling especially ambitious, you might even consider adding a spell-checker to the Notepad application. ■

Gene Kavner is a consultant in the Micro-
soft Consulting Services Division of
Microsoft Corp.

**What do these needy kids have in common
with excess inventory?**



They are all going to college through EAL!!

CALL EAL IF YOUR CORPORATION HAS MATERIAL AVAILABLE FOR DONATION.

- EAL** - Will take your donated material and use it to generate scholarships for needy, deserving students.
- EAL** - Donations could mean an above cost tax deduction - IRS Reg.170(e)(3).
- EAL** - Scholarships are given in the donating corporation's name.
- EAL** - Leverages your gift to help participating colleges.



EAL
Educational Assistance Ltd.™

P.O. BOX 3021 - GLEN ELLYN, ILLINOIS 60138 - FAX (312) 690-0565

For More Details
Call 312-690-0010
(After Nov. 11, 1989 area code 708)
Peter Roskam
Executive Director



PC MagNet News

The Latest Files and Features of PC Magazine's On-line Service

ZiffPlus Makes Staying in Touch a Breeze

If you are one of the thousands of ZiffNet subscribers who access PC MagNet via Datastorm Technologies' *ProComm Plus* communications software, we have some great news. One of our hard-working PC MagNet sysops, James D. McDaniel, has designed a complex script-driven front end that allows easy access to all of PC MagNet's forums and to the rest of the ZiffNet service as well.

Christened "ZiffPlus," this script file can automatically log you on to any forum you choose within our service, and it will also capture all messages and descriptions of files that you request, storing them

into a dated log file.

A new log file is then created whenever you log on. You can elect to view any of these report files from the main ZiffNet menu when you are off-line. You can also designate up to five utility or shareware files to be automatically downloaded from any of the included forums.

This script has been written specifically for *ProComm Plus*, Version 2.01. And we recommend reading the thorough documentation file included in the archive in order to truly specify on-line options and ZiffPlus operations. This script will save you time (and money) on-line and make PC MagNet a slice of heaven for *ProComm Plus* fanatics.

You will find ZiffPlus under the file name ZIFF.ZIP in PC MagNet's UtilForum (GO UTILFORUM), in DL8, CIS Navigation Tips. As with any .ZIP file, it must be extracted with an unzipping utility such as PKZIP.

Book Authors Holding Court in Editorial Forums

Before there ever was a ZD Press to publish *PC Magazine* "guides," there was PC MagNet. As a testing ground for new ideas, PC MagNet subscribers have often served as an intellectual barometer for measuring the level of interest among *PC Magazine* readers for specific topics.

The hottest topics have become new books from ZD Press. In recent weeks, a connectivity guide from Frank Derfler, a laptop guide from Bill Howard, and a guide to Turbo Pascal programming

from Neil Rubenking have been published.

Of course, regular *PC Magazine* columnists and editors such as John C. Dvorak, Bill Machrone, Michael Miller, Barry Simon, Gus Venditto, and William Zachmann are here as well.

The regular meeting spot for these luminaries is PC MagNet's editorial forum, where the latest noteworthy developments are analyzed and discussed.

Log into PC MagNet's Editorial Forum (GO EDITOR) to stay on top and in touch with the latest industry happenings with the premier names in the computer press.—Chris Parker

■ **ZIFFPLUS:** *ProComm Plus* 2.01 scripts save time and money.

■ **AUTHORS ON-LINE:** The leading names in computer publishing are now on-line in our interactive editorial forum.

Instant Access to PC Magazine's On-line Service

PC Magazine operates a 24-hour-a-day interactive dial-up service where readers can find the utilities published in every issue, download an index of all product reviews, share opinions with the editors, and gain access to Computer Library and Consumer Reference Library.

How to Subscribe Right Now!

You can join PC MagNet with one phone call.

1. Choose a phone number by following the directions under "Finding the Number in Your Town" (below)
2. Set your communications software to 300, 1,200, or 2,400 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex
3. Dial the local number. When you connect, type Ctrl-C.
4. At the HOST NAME prompt, type CIS
5. At the USER ID prompt, type 177000.5000
6. At the PASSWORD prompt, type PC*MAGNET
7. At the ENTER AGREEMENT NUMBER prompt, type Z10D9100.
8. Register your name and enter your MasterCard, Visa, or American Express card number. (If you'd like to have your company billed instead, call CompuServe at 800-848-8990.)
9. Your personal User ID and Password will be displayed at the end of the registration process. Record them for logging on over the next few days; a new password will arrive in the mail within ten days to confirm your subscription.

There are no up-front subscription charges; you pay only for the time you spend on-line. CompuServe members can join by entering GO PCMAG at any CompuServe "!" prompt. CompuServe Customer Service can be reached at 800-848-8990. Outside the United States, call 614-457-8650

PC MagNet costs \$12.80 an hour for 1,200- or 2,400-bps service, or \$6.30 an hour for 300-bps service. Billing is based on 1-minute increments.

Finding the Number in Your Town

Using your modem: Dial 800-346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

Using voice: Dial 800-635-6225. Follow the instructions and note the number.

**Of course,
you get better service in 1st class.
And until now,
you had to pay for it.**



Call Swan.

Get the 1st class service you deserve.

At savings you'd never expect.



Bob Timney
Government Sales

Leslie Peters
Corporate and
Educational Sales

Dick Trudel
Vice President
Sales and Service

Todd Cardamone
Technical Support

Joanne Waigand
Sales Consultant



How can one company deliver top-quality computers at amazingly low prices, and still give you 1st class service? Just ask our customers. PC Magazine did.

And in their most recent Service and Reliability Survey of 27 leading PC manufacturers, Swan took top honors in brand loyalty, technical support and repair service.

That's what sets Swan apart. And what's helped make us one of the fastest growing computer companies in the nation. Sure we'd like to sell you computers. But more important, we'll do everything we can to keep you as a loyal customer.

To build 1st class computers, we start with 1st class components.

Pull the cover off any Swan computer and look around. You'll see names like Sony, Hewlett Packard, Quantum, Intel and Teac on the drives, chips and other components we use. Why? Because we don't just build computers. We build value. And because a low-cost computer is no bargain if it's made with bargain components.

Quality costs you less in the long run. And we want to be your computer company for a long time to come.

Then we back them up with the industry-leading 2-year on-site warranty.

Swan is the only major direct marketer with a free 2-year on-site warranty on every 286, 386 and 486 desktop computer we sell.

Of course, that means we're confident in the quality of our products. But it also means we'll be there to protect your investment in Swan products well into the future.



The Swan two-year warranty. A priceless value that will save you money, and give you peace of mind. And it's only available in 1st class, with Swan.

You get fast access to award-winning Technical Support.

If you're tired of sitting on hold, or waiting for a call back "tomorrow", skip the long lines and see what 1st class technical support is all about.

Call Swan, and you'll get right through to what PC Magazine calls "Swan's remarkable support system." And talk to one of the best-trained technicians in the business.

Every minute your computer is down it costs you money. So give us a call. We're here to help. For the life of your machine.

All this, and low prices too?

Consider our new 486SX. It's loaded. And it's priced \$700 less than a Dell 386/33* with fewer features.

And don't miss the extraordinary savings on our rugged new road-ready 386SX Notebook. It's packed with features you won't find anywhere else, at any price.

These are just two examples of Swan's unbeatable values on the computers you really want.

The people of Swan are out to win your business.

Give us a call. Discover for yourself what more satisfied individual, corporate, education and government customers are finding out every day. With Swan, it really does cost less to go 1st class.

Where it costs less to go 1st class.

*Remote locations may incur additional charges.

1-800-468-9044

*Based on September 1991 pricing

386SX/20

- ▲ 1MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ 5.25" or 3.5" Floppy Drive
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 7 Expansion Slots: 6) 16-Bit, 1) 8-Bit
- ▲ 101-Key Keyboard

\$1295

- ▲ 2MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0

\$1995**386/25**

- ▲ 1MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ 5.25" or 3.5" Floppy Drive
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8 Expansion Slots: 1) 32/8-Bit, 5) 16-Bit, 2) 8-Bit
- ▲ 101-Key Keyboard

\$1395

- ▲ 2MB RAM
- ▲ 50MB 17ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0

\$2095**386/33**

- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 100MB 17ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8 Expansion Slots
- ▲ 101-Key Keyboard
- ▲ DOS 5.0

\$2095

- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 100MB 17ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0

\$2595**486SX**

- ▲ 4MB RAM, 8K Internal Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8 Expansion Slots
- ▲ 101-Key Keyboard
- ▲ DOS 5.0

\$2695

- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0

\$3295**486/33**

- ▲ 4MB RAM, 8K Internal Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8) 16-Bit Expansion Slots
- ▲ 101-Key Keyboard

\$3195

- ▲ 4MB RAM, 128K SRAM Cache
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ VGA (1024 x 768) Monitor
- ▲ 1MB VGA Palette Plus Card
- ▲ Both 5.25" and 3.5" Floppies
- ▲ Swan Mouse and Mousepad
- ▲ 101-Key Keyboard
- ▲ Windows 3.0
- ▲ DOS 5.0

\$3995**486/33E***

- ▲ EISA Systemboard With 4MB RAM, Expandable to 64MB
- ▲ 8K Internal Cache, 128K External Cache standard, Expandable to 256K
- ▲ 220MB 12.6ms IDE Hard Drive
- ▲ 12" Monochrome Monitor
- ▲ Both 5.25" and 3.5" Floppies
- ▲ 200 Watt Power Supply
- ▲ 5 Exposed 5.25" and 2 Internal 3.5" Device Bays
- ▲ Ports: 2 Serial, 1 Parallel
- ▲ 8) 32-Bit EISA Expansion Slots: 6 Bus Masters, 2 Bus Slaves
- ▲ 101-Key Keyboard

\$4195

▲ DOS 5.0

386SX Notebook**Features You Won't Find Elsewhere...**

Unmatched VGA Video
64 shades of gray provide outstanding clarity for sharp, clear text and images. The competition is no rival with just 32 shades. The liquid crystal CCFL (Cold-Cathode Fluorescent Lamp) non-glare screen has a resolution of 640 x 480.

Customer Installable Upgrades
Swan will gladly upgrade your Notebook at time of purchase. But if you later decide to add optional equipment, we don't require you to return your notebook to the factory like our competitors do. You can quickly and easily install the options yourself.

Unequaled Power Management
The Swan Notebook is equipped with four user-controlled power management features to reduce battery power consumption. Other notebooks that use only two levels deplete the battery more quickly. Swan's battery will supply power for up to 50% longer.

- ▲ 386SX/16 MHz, 1MB Standard
- ▲ 40MB 23ms IDE Hard Drive
- ▲ Built-in 3.5" Floppy Drive
- ▲ Triple Super Twist CCFL Sidelit LCD Screen, 640 x 480 Resolution, 64 Gray Shades
- ▲ 80-Key Keyboard
- ▲ External VGA Port
- ▲ Ports: 1 Serial, 1 Parallel, PS/2 Mouse, DC In, External Numeric Keypad
- ▲ Slots: Internal Fax/Modem, Internal Memory Card
- ▲ 80387 Coprocessor Socket
- ▲ 1-Year Warranty

\$2195

▲ DOS 4.1

The systems marked with the Swan Express symbol have been built, thoroughly tested and are ready to be shipped to you immediately. Other configurations available.



* Optional tower case pictured includes 300 watt power supply, dual cooling fans and 7 device bays-add \$200. Available for 386/33 and all 486 systems

S=J2A1

1-800-468-9044

Swan is #1 in service and reliability. We don't just say it. We prove it.

1 Swan's Two-Year On-Site Warranty

Swan took a giant step forward this year by extending our free 1-year TRW on-site warranty to 2 years on all 286, 386 and 486 desktop systems*. Compare this powerful protection plan with that of our competitors and you'll find that it beats theirs hands down. In fact, many of them charge as much as \$200 for 2-year coverage with on-site service. As a Swan customer, you can feel secure that your investment will be protected with the best warranty in the industry.

2 Swan's Highest-Quality Components

Quality computers are built with quality components. When you purchase a Swan computer, you can be confident that you are in fact getting only the highest-quality components. Swan selects from industry-leading manufacturers like Conner Peripherals, Teac, Quantum, Hewlett Packard, Sony and Intel.

3 30-Day Money-Back Guarantee

Shopping at Swan is risk-free. If, for any reason, you're not 100% satisfied with any Swan brand product, return it within 30 days for a full refund.

*Remote locations may incur additional charges.

4 Corporate, Education and Government Customer Programs

A special, dedicated sales team serves the unique needs of our rapidly growing base of corporate, education and government customers.

5 Swan's New Leasing Program

This program is designed to ease the financial burden of purchasing computer equipment for your business. Swan's leasing program allows you to conserve capital by spreading your payments out over a specified period. And your lease payments are a fixed amount for a fixed term, unaffected by economic fluctuations. Lease payments are fully deductible as operating expenses as long as they meet IRS guidelines, and leasing does not affect bank credit lines. Leasing gives you the flexibility to upgrade or add on during and at the end of your term.

6 Technical Support is Open Every Day

Our award-winning Technical Support is available 365 days a year. Just call 800-468-7926 toll-free Monday thru Friday: 9am to 9pm, or Saturday and Sunday: 9am to 5pm EST for direct connection to one of our technicians.

Read what the industry experts have to say about Swan

"Swan earned top honors...these ratings mean Swan managed to make and keep its users happier than any other PC manufacturer."



Service and
Reliability Survey,
September 25, 1990

"Swan's engineers clearly demonstrated that the time of building PC's with whatever parts are cheapest is over. The compatibility issues simply take too long to resolve. Changing the components too frequently also raises questions about the manufacturer's ability to service and support the machine."



Bill Machrone,
Editor-in-Chief,
September 11, 1990

"Swan Technologies is wringing thunder and lightning out of the (486) chip...silently ridiculing 486 machines that are less well endowed or can't match Swan's price."

"When it came to extended memory access, the Swan 486 rushed past the other systems—an important consideration for users running operating systems or shells that take full advantage of extended memory."



October 1990

"Not only does it (386/25) look good, the small board uses the latest, most reliable design and manufacturing techniques...it's faster than other uncached machines tested."



November 1990

"Swan's computer (386/33) may have lost some of its price, but it hasn't lost a dime's worth of quality."



August 1991

- No surcharge on credit card orders. • Your credit card is not charged until your order is shipped. • Software or accessories orders over \$100 and under 6 lbs will be shipped Federal Express.
- Orders for in-stock items received before 3pm EST will be shipped same day...and each order is insured at no cost to you!
- 3% or \$5 minimum for UPS Ground. Call for shipping charges on Express Air, APO, FPO, AK, HI and all foreign orders. • If part of your order is backordered, the remainder will be shipped UPS Ground. • Allow 2 weeks for all checks to clear. • ALL SALES (except Swan brand products) ARE FINAL. Items returned must be as-new, without modification or damage. All warranty cards, manuals, and packaging material must be included. Return shipping must be pre-paid and insured, bearing an RA# on the shipping label. • Shipping and upgrade fees are non-refundable. • Defective items replaced or repaired at our discretion. • PA deliveries add 6% sales tax. • Prices & terms subject to change without notice. • Products may differ from photos. • TRW service available for continental U.S., Puerto Rico and Hawaii—additional mileage charges may apply.



**Call today for our
free catalog!**

Featuring a full selection of
systems, printers, monitors, video
cards, modems, drives, accessories,
software and much more!

3075 Research Drive
State College, PA 16801



GSA Contract# GS00K90AGS5325-OPTYR1

Where it costs less to go 1st class.

1-800-468-9044

S=J2A4

by
Charles Petzold

Environments

Multimedia is all hype. Multimedia is flash without substance. Multimedia is yet another ploy to sell expensive hardware and software to gullible users. Multimedia is a tool to create gaudy presentations that will exceed the horrors of desktop publishing. Multimedia is a trap to fritter away your time and not get any real work done.

Ask a dozen industry pundits how they feel about multimedia and you'll get a dozen different answers, very often negative. But I don't care what they say. All I know is that multimedia is fun. And this is not to say that multimedia isn't also important to the evolution of personal computing.

Beginning in this column I'd like to discuss Microsoft's Multimedia Extensions to *Windows 3.0*. Multimedia *Windows* brings to the PC and *Windows* something long lacking: device-independent APIs for enhanced sound and music capabilities (among other goodies).

For too long we've suffered with the limitations of that silly speaker in the PC, capable of little more than a beep. Multimedia *Windows* goes beyond the beep into the realms of digitized sound and synthesized music.

DUMB WORD, NEAT CONCEPT

Multimedia is a catch-all term that refers to the integration of sound, NTSC (National Television Standards Committee) video, and high-quality graphics and animation into the PC.

The word *multimedia* itself is pretty repulsive, I admit. It conjures up images of a flaky museum installation or off-the-wall performance art. But unfortunately we're stuck with the word, so let's just accept it. To me, the idea of integrating sound and video into the PC is an important evolutionary step. As I've said before (and will undoubtedly say again), the personal computer has been relegated to the arenas of number crunching, word processing, and data analysis for too long. Numbers and text are the easy stuff but

Beyond the Beep: The Coming of Multimedia Windows

■ Multimedia *Windows* brings to the PC and *Windows* something long lacking: device-independent APIs for enhanced sound and music capabilities.

account for only a small part of our real lives. For the PC to fully function as an extension of our minds, it must be made to capture, store, process, and render any type of data used in human communication. This includes video images and sound.

In the past, multimedia has manifested itself on the PC in various ways, generally involving dedicated hardware and software. This hardware includes adapters that capture and play back sound and music, as well as hardware that supports various aspects of desktop video: boards that control VCRs and video-processing boxes, and video boards that overlay computer-created images (such as titles) on NTSC video signals. The hardware manufacturers generally provide software that directly accesses the hardware of these boards.

THE DEVICE-INDEPENDENT API

We've learned some very important lessons in this industry over the past ten years, and one of them concerns the link between software and hardware. We've learned that the direct software-to-hard-

ware link must be severed. When many software applications take advantage of a particular piece of hardware, the hardware becomes a standard that too often inhibits progress away from the standard. Likewise, when software relies too much on particular hardware configurations, the software must be periodically updated in order to take full advantage of hardware evolution.

The way out of this quandary is with operating system software that provides a device-independent API (application program interface) to the hardware. This is one of the most important functions of *Microsoft Windows*. Writing a *Windows* program involves treating hardware in a device-independent manner—based on functionality rather than hardware idiosyncracies.

By putting an API layer between hardware and software, we open the industry to many different hardware configurations and varying software applications. The only constant is the operating system software between the hardware and software. The hardware manufacturer provides a *Windows* device driver, which in turn allows *Windows* applications a means to use that hardware through the *Windows* API.

Wouldn't it be nice if the *Windows* device-independent API were extended beyond graphics into the realms of sound and music? Wouldn't it be nice to write *Windows* programs that take advantage of sound and music boards available today, but can also use boards that haven't yet even been invented or conceived?

If this appeals to you, you're probably ready to put aside your present concep-

Environments

tions of multimedia and start having a little fun. You're ready for Multimedia *Windows*.

MULTIMEDIA WINDOWS

Microsoft's approach to multimedia makes a lot of sense in the context of device-independent programming. There are three elements to Multimedia *Windows*: First, Microsoft has defined a minimum hardware standard for a machine called the "Multimedia PC." For the most part, the specifications for the Multimedia PC are based on functionality rather than products. Thus, the Multimedia PC is vendor independent. You'll be able to buy a complete Multimedia PC from several hardware manufacturers, or you can add some hardware to your existing machine to turn it into a Multimedia PC. Indeed, if you have a CD-ROM drive and a Sound Blaster card (available from Creative Labs) on your *Windows* machine, you may already have a Multimedia PC and not even know it!

Back in the early days when Microsoft was working with hardware manufacturers to define the Multimedia PC, it was called the "level 1" standard, indicating that more advanced hardware specifications might be defined in the future. In particular, the level 1 standard focuses mostly on sound. Future standards will probably get into the areas of digital video.

Second, Microsoft has created software called the *Multimedia Extensions to Windows 3.0*. This software includes *Windows* device drivers that access the additional hardware of the Multimedia PC, dynamic link libraries that give *Windows* applications a device-independent API to use this hardware, a new extensible Control Panel for configuration of the hardware, and some other goodies. Basically, the Multimedia Extensions to *Windows* do the same thing for sound that the *Windows* Graphics Device Interface (GDI) does for graphics.

You'll get these Multimedia Extensions from the manufacturers who sell Multimedia PCs or upgrade hardware. You install the extensions on top of an installed version of *Windows 3.x*.

Third, Microsoft has also put together a Multimedia Development Kit (MDK). Programmers use this in conjunction with the *Windows* Software Development Kit

(SDK) to create programs that take advantage of the Multimedia Extensions. The MDK includes additional C header files, import libraries, and tools for creating multimedia applications. The MDK software is shipped on a CD-ROM. Microsoft Press publishes three books that provide programmers' references to this API. They're available in bookstores.

As I'm writing this column during the first few days of summer, the Multimedia Extensions and the MDK are still in beta test. The last I heard, they are expected to be available by the time you read this article.

THE MULTIMEDIA PC

One of the intents of Microsoft and hardware vendors was to allow production of

In an attempt to create relatively inexpensive Multimedia PCs, Microsoft was forced to compromise between cost and the high-powered hardware often desired for multimedia applications.

Multimedia PCs that are relatively inexpensive. They had to compromise between cost and the high-powered hardware often desired for multimedia applications. If anything, they erred by defining a standard that is too weak on the hardware.

The minimum standard Multimedia PC is a 10-MHz 286 box equipped with a 30MB hard disk, 2MB of memory, a 3.5-inch high-density disk drive, a standard 16-color VGA video adapter, and a mouse. Many people would hardly consider this a minimum standard for running *Windows* itself! In addition, the Multimedia PC must include several other pieces of specialized hardware:

It needs to include a CD-ROM drive,

primarily to allow software vendors to ship their Multimedia *Windows* applications on CD-ROM rather than scores of floppy disks. (Yes, multimedia applications often require a lot of data.) The MDK itself will be shipped on CD-ROM. The CD-ROM drive can also play normal music CDs under software control. One of Microsoft's first commercial Multimedia *Windows* applications will use this facility to provide interactive music instruction in Beethoven's 9th Symphony.

Not all CD-ROM drives on the market qualify for the Multimedia PC. The drive must have an internal look-ahead buffer to achieve a continuous transfer rate of 150K per second. New CD-ROM extension software (MSCDEX.EXE 2.2) takes advantage of this buffer. The drive must also have an audio output for playing music CDs. The beta version of Multimedia *Windows* supported the Hitachi CDR-3650, the Sony CDU-541, and the Toshiba XM-3201B, but many other CD-ROM drives are likely to be supported in the future.

The next addition is hardware to sample and digitize audio input through a microphone and to play it back. (Microsoft calls this "waveform audio.") On the input side, the minimum standard sampling rate is 11.025 kHz with an 8-bit sample size. On the output side, the hardware must be capable of 11.025- and 22.05-kHz rates, again at 8 bits per sample. (If you don't know what I'm talking about here, you'll definitely want to check out next issue's Environments column.)

Another requirement is a music synthesizer board that implements the industry-standard Musical Instrument Digital Interface (MIDI). The board must be capable of three simultaneous voices with six-note polyphony each and a percussion channel with five-note polyphony. The sound board must also include MIDI Out and MIDI In ports. I'll be discussing MIDI more in this column sometime in the future. In the meantime, take a look at the Lab Notes column, "Add a Musical Dimension to Your PC with MIDI" in the March 12, 1991, issue of *PC Magazine*.

The audio outputs from the waveform hardware, the MIDI hardware, and the CD-ROM must be mixed together and fed to an amplifier and speakers or (more likely) self-amplified speakers. The final hardware requirement is a joystick port for two joysticks.

The waveform, MIDI, and joystick requirements can all be satisfied with Creative Labs' Sound Blaster card with

Environments

the optional MIDI Connector box installed. This is the only audio board supported under the beta version of *Multimedia Windows* right now, but expect a lot more options in the future.

AN API OVERVIEW

Multimedia Windows adds about 120 function calls to the *Windows* API. These functions have a three- or four-letter lowercase prefix that denotes a general category. For example, 31 functions beginning with the prefix "wave" support the waveform audio facilities. (This is the area of *Multimedia Windows* I'll focus on first in upcoming columns.) You can capture digitized sound through a microphone, store it to disk in files with the extension .WAV, process the sound in various ways if you want, and play it back.

The *Multimedia Windows* API includes 29 functions beginning with the prefix "midi" that support the MIDI synthesizer. As with the waveform functions, you can capture MIDI sequences from a keyboard or other MIDI controller, store them in files with the extension .MID, and play them back.

Six functions beginning with the prefix "time" allow setting a high-resolution preemptive timer routine in a dynamic link library. The timer interval rate can range from 1 millisecond to 55 milliseconds. This facility is primarily for playing back MIDI sequences. Seven "joy" routines allow a program to calibrate and access the joystick.

The largest collection of functions (32 with the prefix "mmp") are devoted to playing back animated "movies" created with the *MacroMind Director* program available for the Macintosh. For now, you'll need a Macintosh to create these movies, but I don't think anyone will be surprised if a version of *MacroMind Director* becomes available for *Windows* sometime in the future.

THE MEDIA CONTROL INTERFACE

The *Multimedia Windows* API also includes seven functions with the prefix "mci" that allow access to the Media Control Interface (MCI). This is a high-level open-ended interface for controlling all multimedia hardware in the *Multimedia PC*. In contrast, the "wave"

and "midi" functions are known as the "low-level" sound interface.

MCI includes many commands that are common to all multimedia hardware. This is possible because many aspects of multimedia can be molded into a tape-recorder-like play/record metaphor. You "open" a device for either input or output, you "record" (for input) or "play" (for output) and when you're done, you "close" the device.

MCI itself comes in two different forms. In one, you send messages to MCI that are similar to *Windows* messages. These messages include bit-encoded flags and C data structures. In the second form, you send text strings to MCI. This facility is primarily for languages such as Asymetrix Corp.'s ToolBook and Microsoft's Visual Basic that have flexible string ma-

**Preemptive
background
processing has been
built into Multimedia
Windows; many of the
play and read function
calls return
immediately and
continue to run in the
background.**

nipulation but not much support for calling *Windows* APIs.

The string-based version of MCI is very nice and quite addictive. Two different functions are available for sending MCI strings. One allows the application program to receive information and error messages back from the device driver. With the other function, *Multimedia Windows* itself handles error reporting to the user via message boxes.

As an example, the following MCI string opens the CD-ROM drive for playing an audio CD:

```
open cdaudio
```

To play from the beginning of track 5, you use the string:

```
play cdaudio from 0 track 5
```

When you want to stop playing the CD and close the CD-ROM drive, use the strings:

```
stop cdaudio  
close cdaudio
```

A sample program included in the MDK lets you send MCI strings interactively. Essentially, it puts you in control of all the multimedia hardware in the *Multimedia PC*.

The approach I'll be taking in these columns is first to discuss the low-level waveform and MIDI interfaces because they offer the most flexibility and give you a better insight into what's happening behind the scenes. Then I'll show you how to perform common jobs with less programmer effort using MCI.

As you know, *Windows* is nonpreemptive. This is a potentially serious problem when it comes to multimedia. For example, when you want to record something (such as waveform audio or MIDI sequences) you want to be able to stop the recording from the application. Similarly, when you're playing something (like a MIDI sequence), you don't want the application to be totally disabled until the sequence is finished.

For this reason, preemptive background processing has been built into *Multimedia Windows*. Many of the play and read function calls return immediately and continue to run in the background. A program is notified of their completion by messages to the window procedure or calls to a DLL callback function. You can tap into this preemptive background processing yourself using the "time" functions.

FILE FORMATS AND RIFF

New types of data require new file formats, and these are also defined by the *Multimedia Windows* API. The most important new file format is called the Resource Interchange File Format (RIFF). This is a tagged file structure that can incorporate many other file formats, including the *Windows* device-independent bitmap (DIB), the *Windows* Metafile (WMF), and a *Windows* palette table. The DIB file definition has been extended (once again) to provide additional compression and color information.

Environments

Waveform files have an extension of .WAV. They contain a header section describing the sampling rate and sample size followed by the raw data. MIDI files have an extension of .MID. The format is the industry-standard MIDI file format.

WHAT? NO VIDEO?

I mentioned earlier that multimedia involves the integration of sound, music, NTSC video, graphics, and animation into the PC. But as you can see, Multimedia Windows focuses almost exclusively on sound and music.

Graphics and animation are supplied by Windows itself through the Graphics Device Interface (GDI). Multimedia Windows provides a few enhancements to GDI in the area of device-independent bitmaps (DIBs). For example, the StretchDIBits routine for displaying bitmaps has been optimized to use 386 code when running on a 386 processor. In the past, if you wanted to display a nonrectangular image using a bitmap, you'd have to create

two bitmaps: one containing the image and another containing a "mask" of the nonrectangular area. Multimedia Windows allows you to specify that a particular color in the bitmap is transparent, which means that GDI won't draw anything for bits of that color in the bitmap.

One problem with DIBs in Windows is that you can't draw on them using GDI

**Multimedia Windows
extends the power of
DIBs by defining a "DIB
driver device context."**

function calls the way you can draw on device-specific bitmaps by selecting them into a memory device context. Multimedia Windows extends the power of DIBs by defining a "DIB driver device context." You can select a DIB into a DIB driver device context and draw on it using GDI

function calls in a device-independent manner.

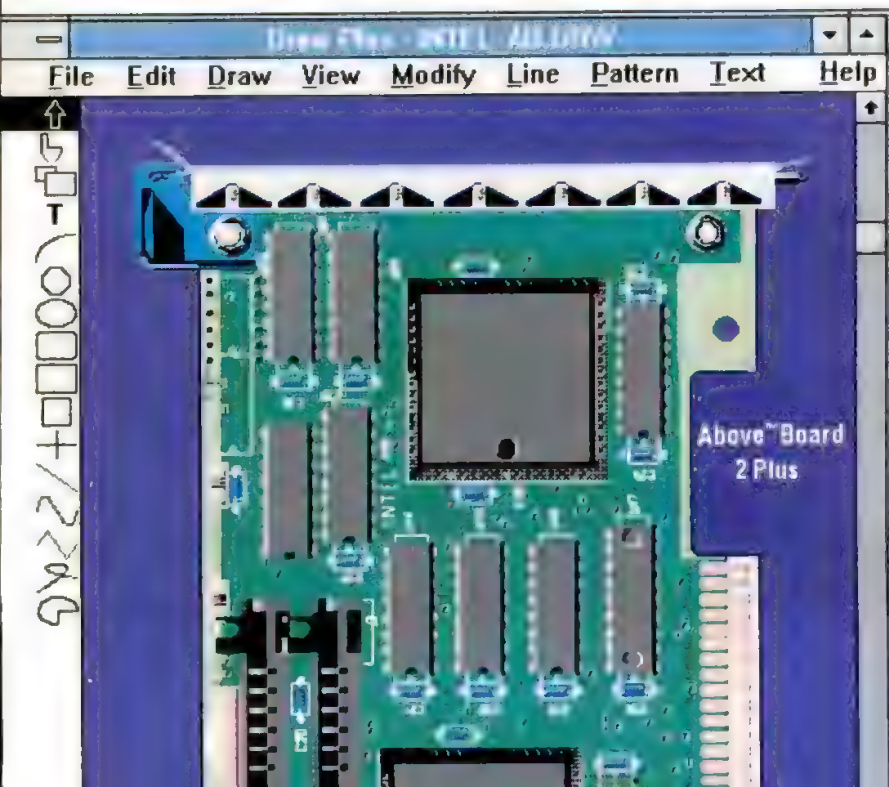
Multimedia Windows doesn't have any support at all for working with NTSC video signals of the sort that come out of your VCR or camcorder. The closest it comes is being able to control a video disk player through MCI. If you're looking for good desktop video support for the PC, Multimedia Windows is currently not the place to find it. (On the other hand, nothing prevents you from using more-advanced video hardware to prepare a multimedia application. For example, you can use a fast video framegrabber to create a sequence of DIBs that mimic full-motion video when played back.)

That the current hardware of the Multimedia PC is sometimes called "level 1" gives us hope that better NTSC video support (including digital video) will be available in subsequent additions to Multimedia Windows.

COMING UP

In the next issue I'll begin examining the waveform audio support in Multimedia Windows, starting with a discussion of what waveform audio is all about. ■

Free Window displays.



Now when you buy Above™ Board memory, you'll not only run Windows® 3.0 applications up to four times faster, you'll get Micrografix® software too. Get Draw Plus®, a quick and easy drawing tool with over 2,200 ClipArt® images, for free (\$229 value). Or, choose Charisma® for only \$59.95 (\$495 value). Charisma combines graphs, word templates, drawing tools and ClipArt for dynamic business presentations. So buy your Above Board now. Before this offer draws to a close.

intel

The Computer Inside.®

CIRCLE 363 ON READER SERVICE CARD

For free information on maximizing Windows 3.0 performance, call (800) 525-5019 for Doc. #09942. For Above Board information, call (800) 536-5374. © 1991 Intel Corporation. Above is a trademark of Intel Corporation. *Other product names are trademarks of their respective owners.

by
Ray Duncan

Power Programming

Programming Considerations for MS-DOS 5.0, Part 1

As this is written, MS-DOS 5.0 has been on the retail market for over a month, and it has proven an eminently worthwhile upgrade to the venerable PC operating system. The Microsoft programmers in charge of DOS 5.0 were highly motivated to eliminate compatibility problems with existing applications, so they invented very few new function calls (shown in Figure 1), and carefully preserved the historical behavior of the DOS application program interface (API). You'd think, therefore, that DOS 5.0's impact on programmers would be minimal—and this was exactly Microsoft's intention during the prolonged DOS 5.0 beta-test period. But as it turns out, DOS 5.0 does have some very important ramifications for applications developers, which can be broadly grouped into six categories: host version checking, the availability of upper memory blocks, driver and application program load addresses, the Task Switcher API, the multiplex interrupt, and the stabilization and documentation of previously undocumented function calls. We'll talk about the first few categories in this column, and the rest in the next issue.

HOST VERSION CHECKING

One of the hallmarks of a robust DOS application program has always been exhaustive sanity checks on the capabilities of the host system. Such an application checks the DOS version number during its initialization and saves this information in order to bypass calls to functions that don't exist (or are known not to work correctly) in the version of DOS under which it is running. Applications such as TSR (terminate and stay resident) utilities—which rely on undocumented DOS functions and internal data structures for successful execution—are especially obligated to make these sanity checks, because the undocumented functions and structures can vary from one version of DOS to another.

The traditional methods of checking have been made more complicated, however,

■ Despite Microsoft's stated intention that DOS 5.0 would have a minimal impact on programmers, there are nevertheless several areas with important ramifications for applications developers.

by one of the new DOS commands—SETVER—which was directed at improving compatibility with existing application software. In the past, many disk defraggers, unerase utilities, and device drivers were written so that they would not run on a version of DOS later than the one in common use at the time they were released. This was done to defend against the possibility that the utility or driver might crash or do damage if a later version of DOS introduced a new disk or partition format. DOS 5.0 has no such new formats, so the end user can employ the SETVER command, in effect to tell DOS to lie about its version number to a particular utility or driver and fool that program into running. Note that SETVER affects only the value returned by interrupt 21h function 30h (Get DOS Version); it doesn't affect the behavior of any other DOS function.

I have mixed emotions about the SETVER command, because inevitably it's going to cause problems in later versions of DOS when new disk formats or

partition types *are* added to the system. But SETVER is with us forever now, so we have to learn to live with it.

From a developer's point of view, the main impact of SETVER will be when you want to take advantage of DOS 5.0-specific features in your program, because there's no way to ensure that the user won't tell DOS to supply a false version number to your application, even when there's no need. In such situations, you need to use one of the few new interrupt 21h services function 33h subfunction 06h, whose calling sequence is

```
mov     ax, 3306h
int     21h
jc      error
```

If this function call returns with the carry flag set, indicating an error, DOS doesn't support the function, and you can trust the results returned by the traditional interrupt 21h function 30h. If the function doesn't return an error, then you're running under DOS 5.0 (or later), and the following results have been placed in registers:

- Major DOS version number in BL;
- Minor DOS version number in BH;
- DOS revision number in low 3 bits in DL;
- Miscellaneous flags (bit 3 = 1 if DOS is executing from ROM, bit 4 = 1 if DOS is executing in the HMA) in DH.

Although it doesn't fall strictly under the umbrella of a DOS 5.0 discussion, I should also point out the importance of checking whether your program is running under the DOS 5.0 Shell's Task Switcher, *Windows* 3.0, or OS/2. If your

Power Programming

program finds itself running under the DOS 5.0 Task Switcher, OS/2 1.x, or Windows 3.0 in Standard mode, your program can get frozen and swapped out to disk, which is not good if your program is trying to control a device directly and handle hardware interrupts. Under Windows 3.0 in 386 Enhanced mode or OS/2 2.0, your program is actually running in Virtual 86 mode rather than in Real mode, which has all sorts of implications for the performance of direct memory-mapped video output, the availability of specific physical memory addresses for DMA or control of a Weitek coprocessor, access to I/O ports, and the ability (or inability) to execute certain privileged CPU instructions.

How do you cope with these possibilities? DOS 5.0 defines a new Task Switcher API (to be discussed in the next issue), which your program can call to notify the

operating system that it should not be suspended. Microsoft apparently intends to put this API into the other environments eventually, but for now, handling execution under Windows and OS/2 is problematic. Detection of Windows presence and its operating mode is somewhat messy, especially if you also want to allow for earlier versions of Windows. For guidance see these recent technical articles: "10 Steps to Windows Coexistence" by Jeff Roberts (*PC Techniques*, February/March 1991) and "Windows Questions and Answers" by Fran Finnegan (*Microsoft Systems Journal*, March 1991).

On the other hand, detection of an OS/2 environment is straightforward: interrupt 21h function 30h returns an absurdly large figure for the MS-DOS major version number (10 for OS/2 1.x, and so on), and OS/2 does not (so far) have a SETVER command.

UMBS AND THE HMA

DOS programmers have had to concern themselves with three different types of

memory for several years now:

- **Conventional memory**, the memory located below 640K that is managed by MS-DOS;

- **Extended memory**, the memory that lies at addresses above the 1MB boundary on 286-, 386-, and 486-based PCs;

- **Expanded memory**, which lies outside the CPU's normal address space but can be made addressable within an area called a *page frame* in small units called *pages* by a technique similar to bank switching.

These are illustrated in Figure 2. DOS 5.0 brings with it two more kinds of memory to worry about: the *high memory area* (HMA) and *upper memory blocks* (UMBs) (shown in Figure 3).

The high memory area consists of the first 64K of extended memory (less 16 bytes); it is available only on PCs based on 286, 386, or 486 CPUs with more than 640K of memory installed. The HMA is a somewhat magical chunk of memory because, even though it lies above the 1MB boundary, it can be addressed in real mode by putting the value 0FFFFh into a segment register and enabling the PC bus's A20 line—segment 0FFFFh plus an offset in the range 10h to 0FFFFh yields linear addresses in the range 100000h to 10FFEFh. (By default, the ROM BIOS disables the A20 line in real mode because, incredibly, there are application programs that rely on the wrapping of addresses at the 1MB boundary.)

Upper memory blocks lie above 640K and below 1MB in the "holes" between the video refresh buffers, ROM BASIC, ROM BIOS, and ROM BIOS extensions for hard disk controllers, high-resolution video adapters, and other such peripheral devices. UMBs are theoretically available on any PC. Practically speaking, however, they are rarely found on 8086/88 machines, moderately common on 286 machines based on certain PC AT-clone chip sets that can remap extended memory into the holes above 640K, and almost always available on 386/486 machines if an expanded memory emulator is present. Expanded memory emulators, which use the 386/486's paging hardware to remap extended memory in page-size units below the 1MB boundary on demand and to simulate hardware-based bank switching, can just as easily map extended memory into the holes permanently and thus provide UMBs.

None of this is really new technology. Windows 2.x, released in 1988, loaded some of its kernel into the HMA to re-

NEW INT 21h FUNCTION CALLS IN DOS 5.0		
INT 21h	NAME	ACTION
Function 33h subfunction 06h	Get True DOS Version	Returns the true DOS regardless of SETVER commands.
Function 4Bh subfunction 05h	Enter Exec State	Used by programs that load other programs directly instead of by calling the MS-DOS Exec Function; allows DOS to fix up its internal state (for example, the version number) to match the program.
Function 44h subfunction 0Dh minor code 68h	Sense Media Type	Returns a code for the type of disk media in the specified drive.
Function 44h subfunction 10h	Query IOCTL for Handle	Returns a flag indicating whether a character device driver supports the specified IOCTL function.
Function 44h subfunction 11h	Query IOCTL for Drive	Returns a flag indicating whether a block device driver supports the specified IOCTL function.
Function 58h subfunction 02h	Get Upper Memory Link	Returns a flag indicating whether allocation of UMBs is enabled.
Function 58h subfunction 03h	Set Upper Memory Link	Enables or disables the allocation of UMBs.

Figure 1: This list describes new interrupt 21h function calls in DOS 5.0. It does not include noninterrupt 21h functions, such as the Task Switcher API, or functions unchanged from DOS 3.x or 4.x that were previously undocumented.

Power Programming

duce its own footprint in conventional memory. Certain TSRs have been able to use the HMA since its "discovery" as well. Commercial EMS emulators like *QEMM-386* and *386MAX* have been supporting UMBs for years—using their own allocation schemes, of course—and have provided special utilities to load device drivers and TSRs into the UMBs. But DOS 5.0 forced the issue on the standardization of HMA and UMB management. DOS 5.0 can shove its own kernel and parts of *COMMAND.COM* into the HMA, and it can make UMBs available to applications through the normal interrupt 21h memory allocation interface, but it will do this only if the appropriate commands are present in *CONFIG.SYS* and if a memory manager supporting Microsoft's extended memory specification (XMS), Version 2.0, has been loaded.

The XMS defines a software interface for control of the A20 address line and for allocation of extended memory, upper memory blocks, and the high memory area, and it is somewhat comparable with the better-known Lotus/Intel/Microsoft expanded memory specification (LIM EMS). Although the XMS 2.0 specification was released by Microsoft in 1987 and 1988, most developers chose to ignore it at first because of the already chaotic situation in extended memory management at that time. Some applications were using the bottom-up or *VDISK* allocation method, others employed the interrupt 15h or top-down method, a few adopted XMS, and DOS Extenders and multitaskers that ran on 386 machines were mostly moving toward the Phar Lap/Quarterdeck *VCPI* interface for the allocation of extended memory.

The full importance of XMS, and the immense power of Microsoft to create standards with or without the cooperation of the rest of the industry, did not become evident until the release of *Windows 3.0*. *Windows 3.0* insisted on the presence of an XMS memory manager if you wanted to run *Windows* in Standard mode or 386 Enhanced mode, and the popularity of *Windows* quickly forced other vendors of EMS emulators and DOS Extenders to fall into line and become compatible with the XMS interface.

The XMS-compatible memory manager shipped with DOS 5.0 is called

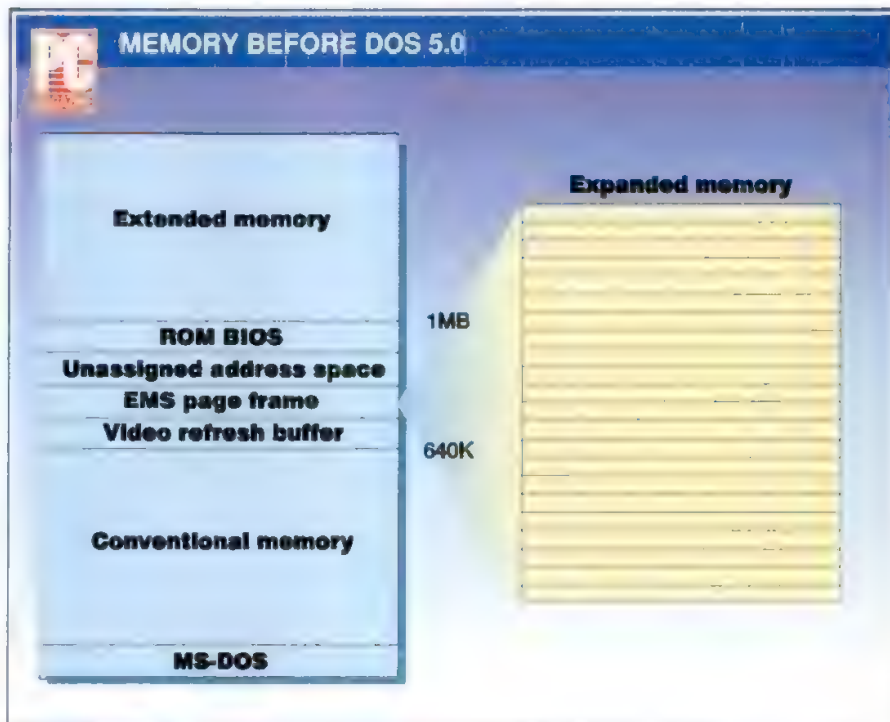


Figure 2: This shows the types of memory available before DOS 5.0: conventional, extended, and expanded.

HIMEM.SYS, and it provides the A20, HMA, and expanded memory services. The DOS 5.0 expanded memory emulator, *EMM386*, also functions as the XMS UMB provider. *EMM386* must be loaded after *HIMEM.SYS* in order to work correctly, and it apparently carries out its UMB duties by hooking the *HIMEM.SYS* entry point and intercepting the XMS UMB function calls, passing the rest of the calls on to *HIMEM.SYS*. The *HIMEM.SYS* driver is available both in executable form and in source code on CompuServe, and many other bulletin board systems. But DOS 5.0 will actually work with any XMS-compatible memory manager (such as the current versions of *QEMM-386* and *386MAX*), and it can even function properly in the presence of several different types of memory managers and UMB providers, as long as they are all compatible with each other.

The XMS programming interface was discussed in detail in the June 27, 1989, installment of this column, but a DOS 5.0-aware application that wants to use UMBs doesn't need to worry about XMS at all. As each device driver is loaded during the processing of *CONFIG.SYS*, DOS checks whether the new driver is an XMS-compatible memory manager and, if it is, DOS allocates all of the UMBs known to the new XMS manager and

links them into its own chain of memory blocks. Thus, an application that tries to obtain UMBs via the XMS interface will find there are none to be had; DOS 5.0 already owns them all. Instead, the application can obtain UMBs by calling the usual DOS memory allocation functions, but first it must notify DOS that it is "UMB-aware." This is a little safety net to keep DOS 5.0 from doling out UMBs to older applications that might become confused if they were handed a memory block at, say, segment D000h.

USING UPPER MEMORY BLOCKS

An application that wants to allocate UMBs should first check whether it is running under DOS 5.0 or later. If it is, it should call interrupt 21h function 58h subfunction 02h (Get Upper Memory Link Status) to determine whether upper memory blocks are currently allocatable, and save this status for later:

```
mov     ax, 5802h
int     21h
```

On return, AL contains 1 if UMBs are allocatable or 0 if they are not. (The default state of the system is that UMBs are not available, but the application may have been executed by another program that has already enabled UMB allocation.) The

Power Programming

application should also call interrupt 21h function 58h subfunction 0 (Get Allocation Strategy) to obtain the current DOS memory allocation strategy and save that value as well:

```
mov     ax, 5800h
int     21h
```

On return, the current allocation strategy is in register AX.

The application can then tell DOS that it is UMB-aware and would like to use UMBs if any are free by calling interrupt 21h function 58h subfunction 3 (Set Upper Memory Link Status):

```
mov     ax, 5803h
mov     bx, 1      ; UMB link flag
int     21h
```

This function call will fail if the command DOS=UMB is not present in CONFIG.SYS.

If the UMB link flag was set successfully, the application must next change the order in which DOS allocates conventional memory and upper memory blocks by calling interrupt 21h function 58h

subfunction 1 (Set Allocation Strategy):

```
mov     ax, 5801h
mov     bx, strategy_flag
int     21h
```

In DOS 3.x and 4.x, the strategy flag in BX could take on only the values 0, 1, and 2, corresponding to first fit, best fit, and last fit, respectively. In DOS 5.0, the possible values for BX are as follows:

- 0000h, conventional first fit, assigns the lowest free block in conventional memory that is large enough to satisfy the request (this is the default allocation strategy);
- 0001h, conventional best fit, assigns the free block in conventional memory that is closest to but not smaller than the requested size;
- 0002h, conventional last fit, assigns the highest free block in conventional memory that is large enough to satisfy the request;
- 0040h, UMB first fit, assigns the lowest free upper memory block that is large enough to satisfy the request;
- 0041h, UMB best fit, assigns the free upper memory block that is closest to but not smaller than the requested size;
- 0042h, UMB last fit, assigns the highest free upper memory block that is large enough to satisfy the request;
- 0080h, generalized first fit, assigns the

lowest free block that is large enough to satisfy the request, searching UMBs before conventional memory;

- 0081h, generalized best fit, assigns the free block that is closest to but not smaller than the requested size, searching UMBs before conventional memory;
- 0082h, generalized last fit, assign the highest free block that is large enough to satisfy the request, searching UMBs before conventional memory.

Once the Set Upper Memory Link and Set Allocation Strategy functions have been called with the appropriate parameters, the application can then allocate, re-size, and release memory blocks with the usual DOS interrupt 21h functions: 48h (Allocate Memory Block), 4Ah (Resize Memory Block), and 49h (Release Memory Block). Before terminating, the application should call the Set Upper Memory Link and Set Allocation Strategy functions again, using the values it obtained and saved during its initialization to restore the system to its original state.

How does all this work behind the scenes? As you're probably aware, DOS keeps track of allocated and available memory by means of memory control blocks or *arena headers*. An arena header is always one paragraph (16 bytes), and it lies just below the memory block that it controls. The arena header, shown in Figure 4, contains several items:

- a 1-byte flag that indicates whether the memory block is the last (highest) in the system;
- a 1-word field that indicates whether the memory block is free or in use;
- a 1-word field that specifies the size of the memory block in paragraphs;
- in DOS 4.0 and later, the filename of the program that owns the block (if any).

DOS keeps the address of the first (lowest) arena header in an internal structure, which has been given the memorable name *List of Lists* by Andrew Schulman (coauthor and editor of the book *Undocumented DOS*, Addison-Wesley, 1991). DOS can then identify each existing memory block, and find those that are currently available, by jumping from one arena header to the next, using the memory block size field.

Although we often say that DOS's memory blocks are chained together, the arena headers are not in fact a linked list, because there is no provision for them to be examined in any order other than their physical order in memory, from lowest to highest. When a program is loaded or

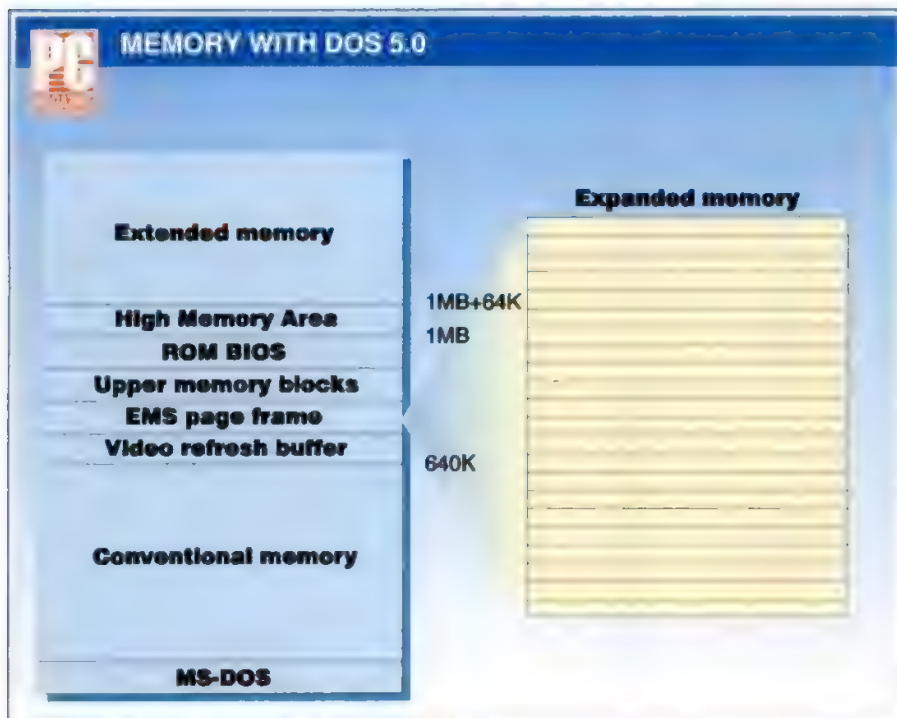


Figure 3: With DOS 5.0, two other types of memory are available: the high memory area and upper memory blocks.

Power Programming

requests a new memory block, DOS finds a free block, according to the current allocation strategy, that is large enough to satisfy the request. It then subdivides the block, assigns the portion of the requested size to the program, marks that block's arena header as "owned," and creates a new arena header marked "free" for the remainder (if any).

DOS 5.0 incorporates UMBs into this memory-tracking scheme using a very simple strategy. During system initialization, if UMB support is enabled by a DOS=UMB statement in CONFIG.SYS, DOS 5.0 establishes an arena header at the very top of conventional memory—that is, in the last 16 bytes before the 640K boundary. This special arena header is always marked as "owned," and its size field is sufficient to jump over any intervening ROM, video buffers, or nonexistent memory to the first available UMB.

As initialization proceeds and DOS obtains more UMBs from XMS memory managers, it creates an arena header at the beginning of each UMB that indicates its size and availability. Any gaps between UMBs are provided for by the creation of additional dummy "owned" arena headers similar to the one at the 640K boundary. When a program attempts to allocate memory, DOS walks up the sequence of arena headers and either continues past the arena header at the 640K boundary or not, depending on the state of the "Set Upper Memory Link" and "Set Allocation Strategy" flags.

PROGRAMS LOADED UNDER DOS 5.0

Whether you choose to make your application program, TSR, or device driver DOS 5.0-aware or not, the fact that a user might run your brainchild under DOS 5.0 means you need to be aware of certain troublesome possibilities.

First, if the DOS 5.0 kernel is running in the HMA, application programs may be loaded at addresses much lower than were possible in any previous version of DOS. For example, on my own 80386 system, about 628K of memory is available in the conventional memory area, meaning that a program run from the command line will find its PSP at approximately segment 0680h. Most programs have no intrinsic problem with this, but if they were built with Microsoft's

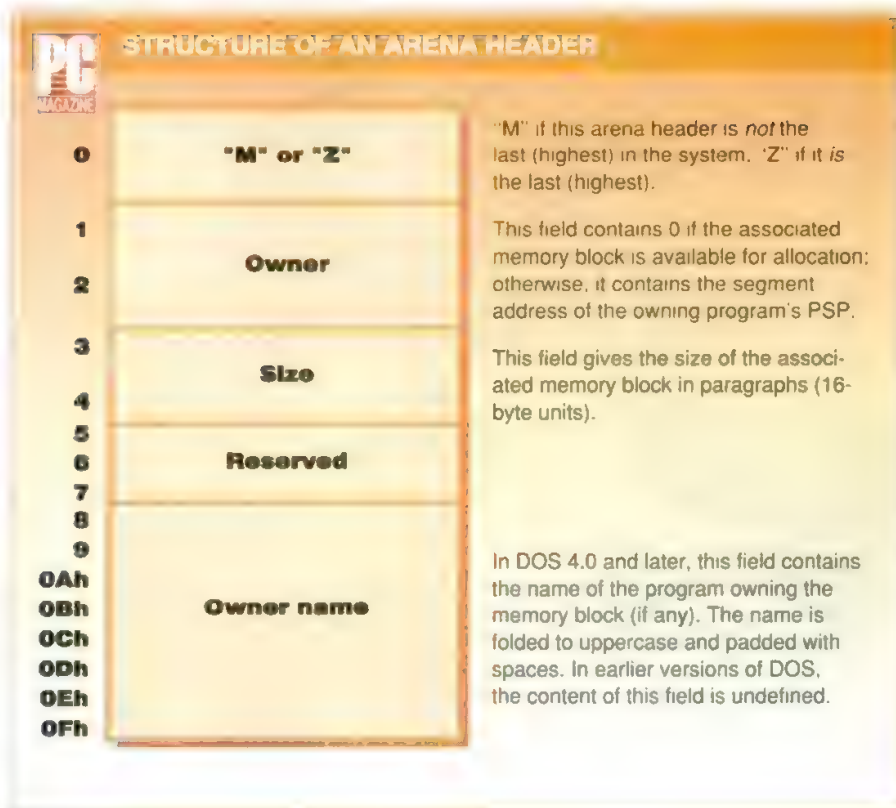


Figure 4: This structure, which was undocumented in DOS 1.0 through 4.0, has finally been conceded as a stable system structure by Microsoft and is documented in the *Microsoft MS-DOS Programmer's Reference*.

LINK.EXE using the /EXEPACK switch, they will bomb immediately, with the inexplicable error message "Packed file corrupt." The /EXEPACK switch does nothing but compress sequences of identical bytes, and insert a small decompression routine at the front of your program. Somehow this simple decompression routine fails miserably if it is loaded at an address below 1000:0000h.

DOS 5.0 includes a workaround for this problem: the LOADFIX utility, which forces your program to load above the 640K boundary. But few users are sophisticated enough to remember that LOADFIX exists, recognize the misleading error message, and take proper recovery action. More likely, users will blame the problem on you and call your tech support line.

Second, if the user chooses to load your program or device driver high (that is, in a UMB) with the LOADHIGH or DEVICEHIGH commands, your program may find itself initializing within a memory block that has a much lower ceiling than it expected. DOS 5.0's only way to tell how much a program or driver needs is to look at the size of the program image, in the case of a .COM file, or the MINAL-

LOC field of the file header, in the case of an .EXE file. Many device drivers, in particular, assume they have oodles of memory available at their initialization time, since in older versions of DOS they were usually getting loaded at the low end of a 640K conventional memory area.

Your best fix is to ship your program as an .EXE file and be sure you set the MINALLOC value correctly. If you insist on shipping a .COM file, make sure your program checks how much memory is available before it does anything else. If it is an application, it can examine the *segment address of first free memory* field in the PSP. If it is a device driver, it can check the *break address* field of the INIT request header; in DOS 5.0, this field is set to the address of the top of the driver's memory block before DOS calls the driver's initialization routine.

THE IN-BOX

Please send your questions, comments, and suggestions to me at any of the following e-mail addresses:

PC MagNet: 72241,52

MCI Mail: rduncan

BIX: rduncan

From the start, VGA was missing one important thing: Video.

VideoVGA brings high quality, recordable video into the Video Graphics Adapter picture. It's true that all VGA boards allow PC users to display graphic images on their monitors. Great, but then what? The printed hard copies or slides—even at their sharpest—just sat there. All too often, so did the audience. VideoVGA takes you to the next step, which can also be a giant leap for your presentations and training.

It's not just a VCR. It's a printer.

If you can shoot it on video, or can create it with your PC, then VideoVGA lets you record it to videotape or videodisc. You can even overlay graphics on live or recorded video. And because of VideoVGA's advanced encoding, the video output is a high-quality NTSC signal, not a fuzzy substitute. Your audience can see the difference, so don't blur a good message with poor output quality.

Your software shines with VideoVGA.

VideoVGA lets you get even more from your software. It's fully compatible with Windows-based presentation and graphics packages, as well as animation, CAD and other VGA software. Whatever you're using to create PC images, you can merge them with video for an extremely persuasive link.

Expand your input options.

The advanced genlock capability of VideoVGA syncs with a broad range of video sources. Cameras. Discs. Recorders. If it's a video source, VideoVGA can sync with it precisely.

Video. Brought to you by Truevision.

While we're not surprised if you've never heard of Truevision, you might be surprised at how often you've seen our work. Truevision TARGA+ graphics engines are the industry standards. They've created professional graphics and animation for board rooms and national broadcasts since 1985.

Now, Truevision gives you what most Video Graphics Adapters can't. Video. Truevision VideoVGA.



TRUEVISION®
CIRCLE 515 ON READER SERVICE CARD

7340 Shadeland Station, Indianapolis, IN 46256

INTERNATIONAL: Canada 416/940-8727 France 33-1-3-952-6253 Italy 39-2-242-4561
U.K. 44-628-77-7800 West Germany 49-89-612-0010 Other international 617 / 229-6900



Single Slot
Full
Resolution
Video
Recording
Supports video
input with 4:2:2
colorimetry, 10
bit and
configuration, 1
to 1000 lines in
video, 1000
lines in video

Call
1-800-4-A-TRUE
for more information

©1991, Truevision, Inc.

by
Fran Finnegan

Windows

ELIMINATING THE MICROSOFT LOGO

Here's a procedure that will allow you to bypass the Microsoft logo screen when starting *Windows* 3.0.

To begin, change into your main *Windows* subdirectory (normally C:\WINDOWS) and, for safety, make a backup copy of WIN.COM using the following command:

```
copy win.com win.bak
```

Read the original WIN.COM into the DOS DEBUG program by typing

```
debug win.com
```

Determine the size of WIN.COM by typing R CX and hitting the Enter key twice. After doing this, your screen should display the following:

```
-R CX
CX ####
:
-
```

where #### is replaced by the hexadecimal size of your WIN.COM file.

Now, using the #### value, enter

```
S 100 L #### 'LOGO'
```

to search for the word LOGO (all caps). DEBUG will respond with the address of LOGO in segment:offset form. For example, if you've used a #### value of 4B9Eh, your display should look like

```
-S 100 L 4B9E 'LOGO'
ssss:0000
-
```

where the ssss:0000 is the returned segment:offset. You'll use the offset in the next steps. DEBUG may list more than one address, but only the first one is relevant. On my machine, the offset portion of the address is 0E80h; yours may be differ-

- **ELIMINATING THE MICROSOFT LOGO:** By changing 1 byte of WIN.COM, you can disable the Microsoft logo display.
- **RUNNING TWO COPIES OF WINDOWS:** Running Real mode under 386 Enhanced mode lets you easily handle *Windows* 2.x applications.
- **LOAD A FILE WITHOUT AN EXTENSION:** *Windows* won't let you load files without extensions, but a *PC Magazine* utility solves the problem.

ent, depending on which release of *Windows* 3.0 you have.

To be sure you found the correct string, display LOGO using the offset that was listed for your system (I'll use my 0E80h as an example in the following steps):

```
D 0E80
```

You should see the word LOGO on the right-hand side of the screen.

Next, you'll have to edit the character L in LOGO. Enter

```
E 0E80
```

and DEBUG will return a 4C. At this point you should enter

```
6C
```

which is the hexadecimal code for lowercase L.

Display "LOGO" to be sure that you

have changed it properly:

```
D 0E80
```

If you make a mistake, you can enter q to quit DEBUG. Otherwise, enter a w to write out the modified WIN.COM, and then enter a q to quit. Now when you run *Windows*, no logo screen will be displayed.

Scott Burr
Beaverton, Oregon



This is one of those tricks that work although you can't figure out why. In any case, there don't seem to be any side effects, so you can try this if you're tired of seeing the big blue Microsoft logo.

The *Windows* Setup program creates WIN.COM by merging three files in your *Windows* SYSTEM subdirectory: WIN.CNF, xxxLOGO.LGO, and xxxLOGO.RLE, where xxx is CGA, EGA, or VGA. WIN.CNF is the heart of WIN.COM, xxxLOGO.LGO is the logo-displaying code (specific to the resolution), and xxxLOGO.RLE is the Run-Length-Encoded bitmap of the logo. The L in LOGO, which was changed in WIN.COM, really comes from the xxxLOGO.LGO file.

If you change your display driver, Setup may create a new version of WIN.COM, which will overwrite your no-logo version. But you can compensate for this possibility. The first 4 bytes of xxxLOGO.LGO are LOGO. Thus, you could use Mr. Burr's procedure to change the first byte of each of the xxxLOGO.LGO files in your SYSTEM subdirectory to lowercase l's. (DEBUG will show the first byte as offset 0100h.) This would preserve your no-logo system.

You can also avoid the Microsoft logo by entering

```
WIN :
```

(WIN, space, colon) to start *Windows*. This works for some, but I've heard oth-

Windows

ers warn that it can make *Windows* "unstable." It would be nice if Microsoft had a firm position on this topic.

RUNNING TWO COPIES OF WINDOWS

I have a 33-MHz 386 with a large hard disk and 4MB of RAM. I often want to run multiple applications at the same time. The problem is that I often use an old application that has not yet been upgraded for *Windows* 3.0 and requires *Windows* Real mode. But running *Windows* in Real mode is ineffective because I lose the benefits of running in Enhanced mode (such as improved memory management).

My solution is to run Real-mode *Windows* from within 386 Enhanced-mode *Windows*. First, copy the *Windows* directory tree into another directory, such as C:\WINREAL. Then run *Windows* from the original C:\WINDOWS directory in 386 Enhanced mode. From within this invocation of *Windows*, launch a second copy of *Windows* in Real mode using C:\WINREAL\WIN.COM. You can then run the old *Windows* 2.x application from this second invocation of *Windows*.

You'll now have two versions of *Windows* running simultaneously. The "top level," running in Enhanced mode, provides you with the context-switching and memory management environment needed to run all your applications. The "lower-level" instance of *Windows* provides the Real-mode environment required for the *Windows* 2.x application.

In fact, I have added a "Real *Windows*" icon, which I can launch directly from the Program Manager. I have set up the "Real *Windows*" .PIF file to provide a large amount of expanded memory.

What do you think?

Michael Trachtman
Eugene, Oregon



This is a nice trick. I myself have accidentally run a second copy of *Windows*, but it didn't occur to me that it could have a useful purpose.

The key to this procedure is running the second copy of *Windows* via the .PIF file, which reserves the Alt-Esc and Ctrl-Esc key sequences for the first copy. (You can make sure the keys are reserved by not checking the Reserve Shortcut Keys Alt-Esc and Ctrl-Esc in the PIF Editor

Advanced Options dialog box.) This approach works because the Alt-Esc and Ctrl-Esc are then heard by the "top-level" *Windows*. That allows smooth switching between the old *Windows* 2.x application and the other 386 Enhanced applications.

The only things you don't have in the Real-mode environment are extra memory (due to the 640K Real-mode limitation) and interapplication communication (via the Clipboard and DDE) back to the 386 Enhanced environment.

It really isn't necessary to make a copy of the *Windows* subdirectory to make this work. I can think of only one reason why you would need to create a duplicate set of files: to maintain a second set of Program Manager group files or a separate set of .INI files. Otherwise, you can simply run *Windows* a second time from your original *Windows* directory.

LOAD A FILE WITHOUT AN EXTENSION

Is there any way to include a filename with a WIN.INI load= statement? I want to load CALENDAR with a file named 91. whenever I start *Windows*. This does not work:

```
[Windows]
load=91.
```

```
[Extensions]
=calendar.exe 91.
```

Nor does

```
[Extensions]
.=calendar.exe 91.
```

Could you offer a solution?

Donald R. Sutter
Portland, Oregon



My initial reaction to this problem was to modify Mr. Sutter's WIN.INI entries as follows:

```
[Windows]
load=91.xxx
```

```
[Extensions]
xxx=calendar.exe 91.
```

The filename on the load= line requires an extension (in this case, .xxx). This extension tells *Windows* which command to look up and execute in the [Extensions] section of WIN.INI. The extension is the link between the load= line (and also the run= line) and an entry in the [Extensions]

section; it can even be an arbitrary string, such as .xxx. Thus, I expected that the command

```
calendar.exe 91.
```

would be executed. Unfortunately, my solution didn't work either. At it turns out, *Windows* appends the extension to the command line even if there is no caret (^) on the [Extensions] entry! (I don't know why it does this.) In this case, *Windows* executes the command

```
calendar.exe 91.xxx
```

Since a file named 91.xxx doesn't exist, CALENDAR loads but without the desired file.

The solution to this problem is to use *PC Magazine's* WINEXT utility (described in the June 25, 1991, Utilities column). WINEXT processes the [Extensions] entries differently than *Windows* does, and permits filenames without extensions to be passed to applications.

To use WINEXT, set up your WIN.INI file as follows:

```
[Windows]
load=91.xxx
```

```
[Extensions]
xxx=winext.exe . calendar.exe ^.
```

The load= line, utilizing the xxx extension, causes the command

```
winext.exe . calendar.exe ^.
```

to be executed. After substituting 91 for the ^, WINEXT in turn executes:

```
calendar.exe 91.
```

which is what you want.

OPENING WINDOWS

Share your *Windows* experience with *PC Magazine*; we'll pay you \$50 for any tip we print. Mail your contribution on-disk, together with a printout, to *Windows*, *PC Magazine*, One Park Avenue, New York, NY 10016, or e-mail it to: PC MagNet: 76244,145 (see page 10 for access instructions) MCI Mail: Fran Finnegan, BIX: franfinnegan, GENIE: finnegan, Internet: finnegan@well.sf.ca.us. We regret that we're unable to acknowledge submissions or answer questions individually. ■

by
Sal Ricciardi

Databases

A POP-UP CALENDAR FOR CLIPPER

The Databases column in the March 12, 1991, issue included a technique that pops up *FoxPro*'s calendar desk accessory from within an application. Unfortunately, the function discussed in that column cannot be used with *Clipper*, because *Clipper* doesn't have a built-in calendar. In any event, I was inspired by Mr. Coupe's idea and wrote a routine to implement a calendar in *Clipper*.

The routine I created is called (like the earlier one for *FoxPro*) POPCAL. To use the procedure, all you have to do is assign it to a key combination with the SET KEY command. For example, the following statement

```
SET KEY -1 TO POPCAL
```

assigns it the F2 function key. Then, whenever you are editing a *Clipper* DATE variable, press F2 and the calendar will appear.

You can move from day to day with the arrow keys. The PgUp and PgDn keys will move you forward and backward one month at a time. Ctrl-PgUp and Ctrl-PgDn will move you forward and backward by



year. You can move the calendar around on-screen by holding down the Shift key and using the arrow keys on the numeric keypad.

When you have selected the date you want, press Enter. The calendar will start with the date in the input field or, if that is blank, the current date.

F. Martin Richardson, Jr.
Annapolis, Maryland



Mr. Richardson's code was too long to print in this column, but you can download it from PC MagNet (look for POPDEM.ZIP). Figure 1 shows the *Clipper* version of POPCAL in action.

While I modified Mr. Richardson's calendar so that it looks more like the one in *FoxPro*, the *Clipper* function still differs from the *FoxPro* calendar in some respects. For example, choosing PgDn in *Clipper* moves the date ahead by 30 days, whereas in *FoxPro* choosing PgDn moves you to the same exact date in the month that follows. A similar difference exists between their respective PgUp commands.

In any event, POPCAL.PRG can serve as a base routine—one that you can modify before incorporating it into your own applications.

ADD DISPLAY STRUCTURE TO CLIPPER

Users of *FoxPro* or *dBASE* have a command, DISPLAY STRUCTURE, that lets you display the structure of a database. The letter "Displaying .DBF Structures," published in the March 26, 1991, issue, offered *Clipper* Summer 87 users a way to accomplish the same task. Unfortunately, *Clipper* Summer 87 has no single command to display database structure information.

Now, with Nantucket's *Clipper* 5.0, you can make the DISPLAY STRUCTURE command available simply by adding it to the language as a user-defined command. UDC's are a powerful new addition to *Clipper*'s programming arsenal: Once you've defined the new command, all your *Clipper* applications can use it as though it were a part of the *Clipper* language itself. Just include the UDC definition with your source code.

The program DISPSTRU.PRG (shown in Figure 2) illustrates how to use a UDC to display database structure information. In a nutshell, I defined a new command called DISPLAY STRUCTURE. Whenever the

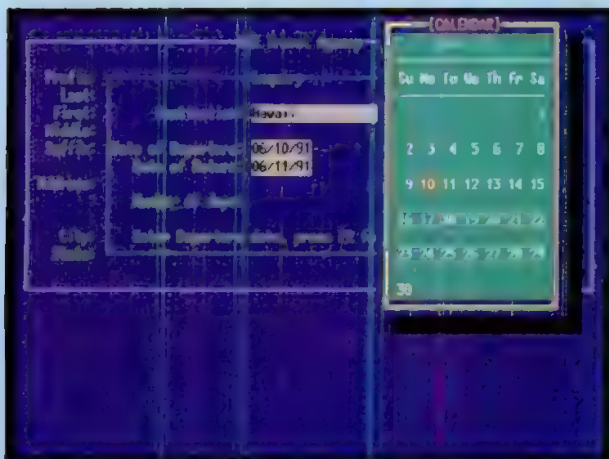


Figure 1: The POPCAL user-defined function lets you pop up a calendar in your *Clipper* applications.

DISPSTRU.PRG	COMPLETE LISTING
<pre>***** * DISPSTRU.PRG Clipper 5.01 * * Command line utility to display the structure of a Clipper DBF file. * Usage: DISPSTRU <dbf> [TO <filename>] [TO PRINTER] * ***** #include "set.ch" * * --- Define the UDC "DISPLAY STRUCTURE" * #command DISPLAY STRUCTURE [<print: TO PRINTER>] [TO <(file)>] ; => disp_stru(<(file)>, <.print.>) PARAMETERS dbffile, tto, dest IF tto <> NIL tto = UPPER(tto) ENDIF IF (dbffile == NIL) .OR. ((tto = "TO") .AND. (dest = NIL)) dispusage() RETURN ENDIF IF AT(".",dbffile)=8 dbffile = dbffile+".dbf" ENDIF USE (dbffile) NEW DO CASE CASE "" = dest .OR. dest = NIL DISPLAY STRUCTURE CASE LEFT(UPPER(dest),4) = "PRIN" DISPLAY STRUCTURE TO PRINTER OTHERWISE DISPLAY STRUCTURE TO (dest) ENDCASE RETURN NIL ***** * disp_stru() Clipper 5.01 * *****</pre>	<pre>* Function called by User Defined Command "DISPLAY STRUCTURE" ***** FUNCTION disp_stru() #include "dbstruct.ch" PARAMETERS file, print oldprintf = SET(_SET_PRINTFILE) oldprint = SET(_SET_PRINTER) oldcons = SET(_SET_CONSOLE) ** Save these for restoring ** later DO CASE CASE "" <> file .AND. file <> NIL SET PRINTER TO (file) ADDITIVE SET CONSOLE OFF SET PRINTER ON ** Send to file additive ** shut off console CASE print SET CONSOLE OFF SET PRINTER ON ** Shut off console ENDCASE ?? "Structure for "+UPPER(dbffile) ? "Name", "Type", "Len", "Dec" ? "-----", "-----", "-----", "-----" AEVAL((ALIAS())->(DBSTRUCT()),(adbfstruct .) QOUT(PAD(adbfstruct[DBS_NAME], 18),) " " + adbfstruct[DBS_TYPE], STR(adbfstruct[DBS_LEN], 3), STR(adbfstruct[DBS_DEC], 3))) ? SET(_SET_PRINTER, oldprint) SET(_SET_PRINTFILE,oldprintf) SET(_SET_CONSOLE, oldcons) RETURN NIL ***** * dispusage() - Display usage information ***** FUNCTION dispusage ?? "Usage: DISPSTRU <dbfname> [[TO <filename>] [TO PRINTER]]" RETURN NIL</pre>

Figure 2: The DISPSTRU program will display the structure of a *Clipper* .DBF file from the DOS command line.

compiler encounters this command, the compiler replaces it with the function DISP_STRU(). Believe it or not, that's all it takes.

In the program, the job of obtaining and displaying the structure information is done in the AEVAL() function. First, DBSTRUCT() returns an array of database structure information based on the database pointed to by the ALIAS() function. AEVAL() then traverses the array, executing the code block passed as its second argument against each element of the array. The code block (surrounded by the braces {}) accepts the array as a parameter, calls it adbfstruct, and uses the QOUT() function to output the structure information contained in each array element.

This is an example of *Clipper* 5.0 programming that may look quite alien if you are used to ordinary dBASE language syntax; code blocks, preprocessor directives, and multidimensional arrays can seem very foreign at first. However, they enable the creation of very compact source code.

Hartley Macklin
Winnipeg, Manitoba
Canada



The user-defined command capability first introduced in *Clipper* 5.0 lets you add new commands to the language or modify existing ones. In fact, *Clipper*'s STD.CH file contains the modifiable definitions for most of *Clipper*'s commands.

I added two options to Mr. Macklin's original submission. The first lets you send structure information to a file using the optional TO <filename> clause. The second lets you send structure information to the printer using the optional TO PRINTER clause. To use DISPSTRU from the DOS command line, just type the command followed by the name of the relevant database file. For example, to display the structure of a database file named SALES.DBF, just type:

```
DISPSTRU sales.dbf
```

To save the information to an ASCII file or send the output to a printer, type

```
DISPSTRU sales.dbf TO sales.asc
```

and

```
DISPSTRU sales.dbf TO PRINTER
```

respectively. The #COMMAND preprocessor directive in *Clipper* 5.0 lets you define a command template that tells *Clipper* how to translate your UDC into functions and commands that *Clipper* can compile. You can also define optional clauses (such as the "TO PRINTER" clause in the example) and specify how command arguments are translated and presented to the functions and commands that result.

A more-detailed discussion of *Clipper*'s UDC capability is beyond the scope of this column, but suffice it to say that UDCs add a great deal of flexibility to the process of extending *Clipper*.

LET US HEAR FROM YOU

Share your database experience, tips, and techniques; we'll pay you \$50 for any submission we print. Mail your submission on a disk, accompanied by a printout, to Databases, *PC Magazine*, One Park Avenue, New York, NY 10016; or upload it to PC MagNet (see page 10 for access instructions). You may also contact Sal Ricciardi via PC MagNet, mailbox 72241.33. We regret that we are unable to acknowledge submissions or answer questions individually. ■

by
Craig Stinson

Spreadsheets

ARRAYS IN EXCEL

I use a simple *Microsoft Excel* database to record transactions by date, account, and category. Figure 1 shows an example of some of these transactions. As the months roll by, I'd like to keep running totals of the amounts I spend in each category. I know I can do this with the Data Table command, but I'm annoyed by how long it takes *Excel* to recalculate data tables. I could use a set of DSUM formulas, but I would then have to set up separate criteria ranges for each category—a nuisance I'd like to avoid.

I've heard that there's a way to use array formulas to generate my running totals, but I don't understand array formulas. Can you help?

Lisa Boehm
Solana Beach, California



Yes. One of the things you can do with arrays in *Excel* is create a single formula that does the work of many separate nonarray formulas. In your sample worksheet, your transaction amounts occupy cells B2:B19, and your category entries appear in cells E2:E19. For reasons we'll come to in a moment, we'll consider the database range as extending to row 20 (which is now blank). If you wanted to tally up all the Medical expenses, you could write a series of formulas like this:

```
=B2*(E2="Medical")  
=B3*(E3="Medical")
```

and so on, with one formula for each row of your database. Each of these formulas would multiply a transaction amount times a logical expression. The logical expression would in each case return either 0 (if the transaction did not fall into the Medical category) or 1 (if it did). So the result of each formula would be either 0 or the amount of a single Medical transaction. At the bottom of this column of formulas, you could use a simple SUM function to generate the total of your Medical ex-

- **ARRAYS IN EXCEL:** Use *Excel*'s array formulas instead of the Data Table command for faster, more-versatile cross-tabulation.
- **CUSTOM EXCEL STARTUPS:** Invoke *Excel* in several different custom ways by using these mostly undocumented command-line switches.

penses. Then you could repeat this whole sequence of actions for all the other categories in your database.

Compared with all this labor, the slowness of Data Table recalcs doesn't seem so bad! But *Excel*'s array feature lets you sum each category with a single formula. Here's how the formula might look for the Medical category:

```
{=SUM(B2:B20*(E2:E20="Medical"))}
```

This formula looks a lot more complicated than it really is. Moreover, if you assign names to the relevant ranges in your database, you can simplify the formula considerably. For example, by assigning the names Amount and Category to cells B2:B20 and E2:E20, respectively, you can turn this formula into something eminently readable:

```
{=SUM(Amount*(Category="Medical"))}
```

The formula says, "For the first value in the range named Amount, compare the first value in the range named Category against the string constant 'Medical'. Multiply the Amount value times the result of the comparison. Continue in this manner for each value in Amount and its

corresponding value in Category. When you reach the end of the range, give me the sum of your calculations."

When entering this formula, do not type the braces. Instead, press Shift-Ctrl-Enter after typing the formula. That key combination tells *Excel* you've entered an array formula, and *Excel* responds by inserting the braces. If you need to edit the formula, be sure to press Shift-Ctrl-Enter again when you finish. If you forget to press Shift-Ctrl-Enter in either circumstance—when entering or editing the formula—you'll get an error constant instead of the sum you're looking for.

The next time you enter a transaction, go to row 20 and use the Edit Insert command to insert a new row. *Excel* will put the inserted row above row 20 and expand the definitions of Amount and Category to B2:B21 and E2:E21, respectively. Your array formulas will therefore not need to be adjusted. (This is the reason for including the blank row in the original range definitions.)

The array approach to cross-tabulation has some advantages over the traditional Data Table method. First, as Ms. Boehm points out, tables are slow to recalculate. In a database with a hundred records, you may find yourself waiting a minute or two each time *Excel* updates the table. Recalculation of the arrays is less time-consuming, in part because *Excel* can bring its intelligent recalculation algorithm to bear on the problem and ignore the line items that haven't changed (tables, in contrast, are always recalculated in toto). Moreover, while your arrays are being recalculated, you can still do useful work in *Excel*; it's hourglass time when *Excel* updates a table.

Second, each array formula is an independent entity. If you keep a column of category totals using array formulas, you can sort those totals, move particular items to other parts of the worksheet (or other worksheets), or delete items that are no longer of interest. A table, by contrast, is an indissoluble unit: You can't sort it, add

Spreadsheets

	A	B	C	D	E
	Date	Amount	Account	Payee	Category
2	1/2/91	242.31	Checking	Totara Surgery	Medical
3	1/1/91	166.41	MasterCard	Big Bear	Phone supplies
4	1/1/91	88.00	Checking	Federal Express	Postage/shipping
5	1/25/91	96.93	Checking	Radio Shack	Telephone
6	1/25/91	20.00	Checking	Software Fundament	Software
7	2/1/91	75.20	Checking	Federal Express	Postage/shipping
8	2/1/91	30.30	Cash	Super Market	Traavel
9	2/1/91	10.00	Checking	Chewon	Car maintenance
10	2/1/91	107.85	Checking	McJ Mail	Telecommunications
11	2/24/91	75.05	Checking	Radio Shack	Telephone
12	2/24/91	26.40	MasterCard	Radio Shack	Telephone
13	2/24/91	66.34	MasterCard	Power Up Software	Software
14	3/1/91	11.00	Checking	Pharmacy	Medical
15	3/1/91	45.30	Checking	Dr. Adams	Medical
16	3/20/91	9.00	Checking	Dr. Adams	Check charges
17	3/20/91	81.00	Checking	Dr. Adams	Medical
18	3/22/91	124.00	MasterCard	Four Seasons Transport	Traavel
19	4/1/91	58.11	Checking	Radio Shack	Phone supplies

Figure 1: A simple *Microsoft Excel* database that records transactions by date, account, and category. You can use *Excel*'s array formulas rather than the Data Table command to cross-tabulate such a database.

to it, or subtract from it without re-creating the entire table.

Finally, if you incorporate named ranges into your array formulas as I've suggested, each total will be self-documenting. You'll be able to look at the formula line and see immediately how your totals were derived.

CUSTOM EXCEL STARTUPS

Judging by the mail I receive, a lot of *Microsoft Excel* users would like to be able to start their spreadsheet program without a blank worksheet in place. I have recently learned (from Dan Williams, of Microsoft's *Excel* Developer Program) that an undocumented command-line switch allows you to do exactly that. Start *Excel* with the command

EXCEL /E

and you'll get an empty workspace instead of SHEET1.XLS. This works only in *Excel* 3.0; in *Excel* 2.1, the /E switch has no apparent effect.

You should be aware that, like any other undocumented feature, this method of launching *Excel* is not supported by Microsoft and could have some unforeseen consequences. It also might not be available in future versions. If these prospects do not deter you, and you like beginning your *Excel* sessions without SHEET1, you might want to modify your *Excel* launch icon in Program Manager so that it always uses the /E switch. To do that, select the icon, choose Program Man-

ager's File Properties command, click the mouse at the end of the second line in the dialog box, and then type a space followed by /E.

Here are some other documented and

An undocumented command-line switch lets *Microsoft Excel* users start their spreadsheet program without a blank worksheet in place.

undocumented ways to start *Microsoft Excel* 3.0:

To begin with a particular worksheet instead of SHEET1, type

EXCEL filespec

where *filespec* is the path and filename of the worksheet you want to open. (You can omit the XLS extension from the filename, and you can leave out the path if the startup sheet is located in the *Excel* program directory.) You can launch more than one worksheet at once this way. For

example, typing

EXCEL 1991 1992

starts the program with two open sheets named 1991.XLS and 1992.XLS. (This option works in Version 2.1 as well as Version 3.0.)

To open a startup worksheet in read-only mode, precede the filespec with /R. For example, type

EXCEL /R EYESONLY

to start *Excel* with an unmodifiable copy of EYESONLY.XLS.

To start with a blank macro sheet instead of a blank worksheet, type

EXCEL /M

The blank macro sheet will have the dummy name MACRO1. (This works in both 2.1 and 3.0.)

To start *Excel* and set the default data directory to something other than *Excel*'s program directory, type

EXCEL /P pathname

where *pathname* points to your desired data directory. You can combine this switch with /E or /M. For example, to start *Excel* with a blank macro sheet and the data directory set to D:\, you could type:

EXCEL /M /P D:

Finally, to amuse your friends and baffle your enemies (or vice versa), try launching *Excel* (2.1 or 3.0) with the /D switch. This one (D for *demo*?) presents a persistent hourglass and causes *Excel* to ignore all user input, whether from the mouse or the keyboard. The only way you'll be able to shut the program down will be by quitting *Windows*.

HINTS, TIPS, QUESTIONS

Share your latest spreadsheet discovery through *PC Magazine's* Spreadsheets. We'll pay you \$50 for any tip we print. Submit your letter on a disk, together with a printout. Mail your contribution to Spreadsheets, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we are unable to acknowledge submissions or answer questions individually. ■

by
Costa Rodis

The Working Word

REMOVING EXTRA SPACES

In a long document, it's easy to insert an unwanted extra space now and then between words or after a punctuation mark. Extra spaces are easily missed, especially in a graphical environment such as *Microsoft Windows 3.0*.

My macro searches your documents for two consecutive spaces that do not follow a period or a colon and lets you delete any unnecessary spaces.

I've included two versions, one for *Microsoft Word for Windows* (Figure 1) and one for *Microsoft Word 5.0* (Figure 2). Both macros start by saving current settings and switching to a display mode that better reveals extra spaces.

When an extra space is found and deleted, the macros back up a character to catch a possible third space on the next search. If you break out of the *Word 5.0* macro by hitting Esc, the temporary bookmark and display mode will remain.

Daniel Hobart
Bagnols-sur-Cèze, France

■ **REMOVING EXTRA SPACES:** *Winword*, *Word 5.0*, and *WordPerfect 5.1* macros that delete unwanted double spaces from your documents.



Since the *Word for Windows* macro was created with the French version of the program, none of the macro language keywords corresponded with the American version. Fortunately, Mr. Hobart saved the macro as a template. *Word for Windows* automatically translates foreign template macro commands into English ones when you open a template (File, Open, FILENAME.DOT) and edit the macro in template context (Macro, Edit, Context Template). But because it has already been translated into English, you won't have to go through

these steps for this macro.

This macro does its job by setting up a number of conditions, performing a search, popping up a message box to ask if you really want the current space deleted, and finally restoring the edit screen to its original state. Let's walk through it.

The On Error Goto Quit command ensures that you are taken out of the macro if any errors occur during the start of the macro. The current screen modes are recorded, and then you're put into draft mode. This lets you see the text in monospaced format, which makes it much easier to spot double spacing. Naturally, double spaces will be selected during the search process, but monospacing lets you see additional extra spaces easily.

The OKChar\$ = ".:!?" statement places the period, colon, exclamation point, and question mark into a retrievable character string for use in a later statement. (I added the question mark and exclamation point, since many of us do use expressive punctuation!)

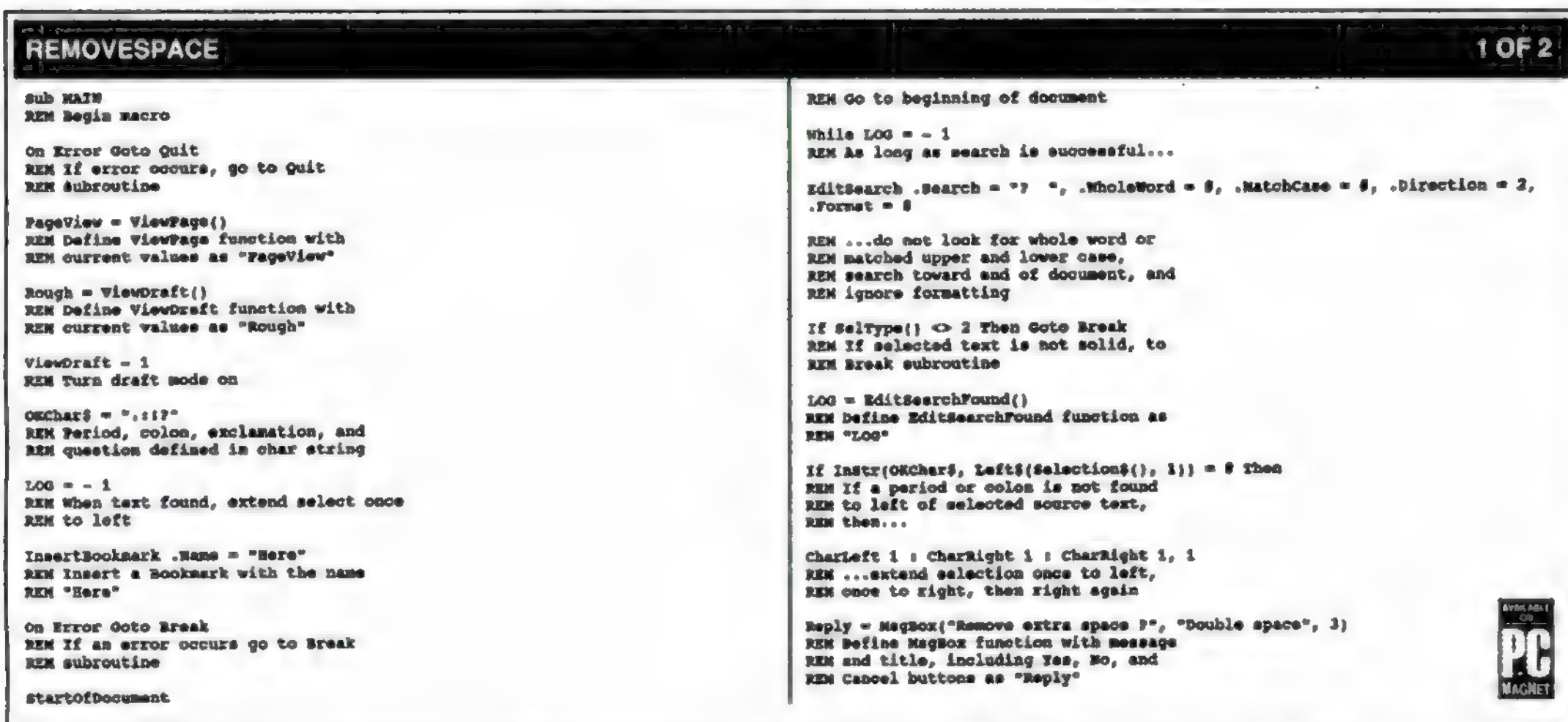


Figure 1: This is a *Microsoft Word for Windows* macro that finds double spaces in your document and asks whether you want them deleted. It checks for terminal punctuation (periods, colons, questions marks, and exclamation points) and ignores the double spaces that follow them.

REMOVESPACE	2 OF 2
<pre> If Reply = - 1 Then REM If Yes button chosen... EditClear - 1 REM ...delete the selected text from REM one char to left of insertion point ElseIf Reply = 1 Then REM Otherwise, if Cancel button REM chosen... Goto Quit REM ...go to Quit subroutine End If REM End the current If subroutine CharLeft 1 REM Move the cursor once to the left End If REM End this If subroutine </pre>	<pre> REM End While subroutine Break: REM "Break" subroutine EditGoto .Destination = "Here" REM Move cursor to "Here" bookmark InsertBookmark .Name = "Here", .Delete REM Delete Bookmark Quit: REM "Quit" subroutine If PageView Then ViewPage PageView REM If in ViewPage mode, return to that REM mode If Not Rough Then ViewDraft Rough REM If not in draft mode, go to draft REM mode End Sub REM End macro </pre>

A bookmark with the name "Here" is inserted into the text at the point where your cursor is when you start the macro. A new On Error statement supersedes the earlier one and takes you to the Break label if an error occurs. If, for example, a search fails, the macro first moves you back to the Here bookmark, then deletes it. If no error occurs, the macro continues and the cursor is moved to the beginning of the document (StartOfDocument).

A While subroutine performs the actual search, setting up the search criteria and prompting you to delete or not delete extra spaces that don't follow terminal punctuation, or to cancel the macro. As long as the search routine finds extra spaces (While LOG = -1), the search criterion is to look forward through the document for two consecutive spaces. Since you don't have to worry about whole words, upper- or lowercase text, or text formatting during this search, those criteria are set to 0 (zero). If the found text is selected (highlighted) in a mode other than solid (that is, if the text is in a mode that's hidden or invisible), the macro is ended through the Break subroutine as this line indicates:

```
If SelType () <> 2 Then Goto Break
```

Text located by *Winword's* search function is always selected as solid. Other selection types, such as hidden and dotted, can make it difficult or impossible to see whether or not extra spaces exist. By exiting the macro in this case, you would reset the screen mode. Running the macro again will make solid selections the rule.

The LOG = EditSearchFound setting returns -1 to the macro if the search is

unsuccessful and a 0 if it is not. The If InStr(OKChar\$... string determines that if two spaces are not adjacent to one of the previously defined punctuation marks, the macro moves on to the delete procedure. Otherwise, the search continues.

If an extra space is found, a message box with the title "Double space", the message "Remove extra space?", and three buttons pops up. (The 3 argument on

the Reply = MsgBox... line requests the three buttons Yes, No, and Cancel.)

If you choose Yes, the selected space is deleted. Answering No continues the search to the next double-space occurrence. If you select Cancel, the macro is exited through the Quit subroutine.

The Wend statement indicates the end of the While loop; instructions between While and Wend will get executed repeatedly until the While condition is no

REMSpaces.DOC	COMPLETE LISTING
<pre> «Set echo="off"» «COMMENT Get default setting in Options,» «COMMENT show all non-printing symbols:» <Esc>o<Tab 3>«Set SHOW=Mid(Field,1,1)»a<Enter> «COMMENT Mark cursor position w/bookmark:» <Esc>fkHERE<Enter> «Set LOG=1» «COMMENT Go to top of doc and search for spaces:» <Ctrl PgUp><Esc>s<Space 2><Tab>d<Enter> «COMMENT If punctuation exists 2 spaces» «COMMENT to left of cursor, search not» «COMMENT successful (so search again):» «While found» «If Mid(Selection,1,1)=".»«Set LOG=0»«EndIf» «If Mid(Selection,1,1)=":»«Set LOG=0»«EndIf» «If Mid(Selection,1,1)="!»«Set LOG=0»«EndIf» «If Mid(Selection,1,1)="?»«Set LOG=0»«EndIf» «If LOG=1» «COMMENT Move cursor to extra space:» <Right><Left 2> «COMMENT Press enter to delete space» «COMMENT or any other character + enter» «COMMENT to skip this occurrence:» «ASK OK=? «Delete space, X+« to skip» «COMMENT Reposition cursor in case» «COMMENT there is more than 1 extra space:» «If OK=""«<Left 2>»«EndIf» «EndIf» «COMMENT Reset search parameters and start over:» «Set LOG=1» «Shift F4» «EndWhile» «COMMENT Return to & delete bookmark,» «COMMENT reset screen:» <Esc>jkHERE<Enter> <Esc>fk<Enter>y <Esc>o<Tab 3>«SHOW»<Enter> </pre>	

Figure 2: This Microsoft Word 5.0 macro replicates the basic features of REMOVESPACEs. Without the Windows graphical interface of *Winword*, its operation is less elegant.

Working Word

REMOVESP.WPM	COMPLETE LISTING
{IF}{STATE}&128~ {Block} {END IF}	{})If-Block-is-on...~ {})...toggle-Block-off~ {})End-IF-statement~
{IF}{STATE}&512~ {Reveal Codes} {END IF}	{})If-Reveal-Codes-is-on...~ {})...toggle-Reveal-Codes-off~ {})End-IF-statement~
{ON CANCEL}{GO}Quit~	{})When-F1-hit,-go-to-Quit-label~
{(Format)OPKY(Enter)BE(Enter){Enter}{Enter}{Exit}) {Home}{Home}{Up} {GO}Look~	{})Create-unique-marker~ {})Go-to-top-of-document~ {})Go-to-"Look"-Label~
{LABEL}Look~ {ASSIGN}6~ {ASSIGN}9~ {IF}{STATE}&128~ {Block} {END IF} {ON NOT FOUND}{GO}Quit~	{})Clear-Variable-6~ {})Clear-Variable-9~ {})If-Block-is-on...~ {})...turn-Block-off~ {})End-IF-statement~ {})When-Search-fails-go-to-"Quit"-Label~
{Search}..{Search} {Left}{Left}{Left} {Block}{Right} {Macro Commands}36(Enter) {IF}"(VAR 6)"="." " "(VAR 6)"="," " "(VAR 6)"="!" " "(VAR 6)"="?"~ {Right} {GO}Look~ {END IF} {Block}{Right} {CHAR}9"Delete this space? (Y/N)~	{})Search-for-two-spaces~ {})Move-cursor-to-left-3-times~ {})Block-one-character~ {})Place-character-in-Variable-6~ {})If-Variable-6-is-equal-to... or:1.or:1.or:2....~ {})...move-cursor-1-character-to-right~ {})and-loop-to-"Look"-Label~ {})End-If-statement~ {})Block-one-character~
{CASE}{VAR 9}~Y"Delete"Y"Delete~n"Look"~n"Look"~{ELSE}~Quit~	{})Place-message-on-screen-and-place-user-response-in-Variable-9~ {})When-user-response-is-Y-or-Y,go-to-"Delete"-Label;when-response-is-n-or-N,go-to-"Look"-Label;otherwise-go-to-"Quit"-Label~
{LABEL}Delete~ {Block} {Del} {Left} {GO}Look~	{})Toggle-Block-off~ {})Delete-space~ {})Move-cursor-once-to-left~ {})Go-to-"Look"-Label~
{LABEL}Quit~ {STATUS PROMPT}~ {DISPLAY OFF}{DISPLAY ON} {IF}{STATE}&128~ {Block} {END IF} {Home}{Home}{Up} {Search}{(Format)OPK(Format)OR}{Search}	{})Clear-screen-prompt~ {})Refresh-screen~ {})If-Block-is-on...~ {})...toggle-Block-off~ {})End-IF-statement~ {})Go-to-top-of-document~ {})Find-cursor-placement-marker~
{Block}{Search Left}{(Search){Backspace}Y{Backspace} {QUIT}	{})Delete-marker~ {})End-macro~

Figure 3: A *WordPerfect* 5.1 macro built using the same basic ideas and structures as the two preceding *Microsoft Word* macros.

longer true. The Break subroutine moves the cursor to the bookmark, then deletes it. The Quit subroutine returns the screen to its original edit mode.

The *Microsoft Word* 5.0 macro, REMSPACES.DOC, while not as sophis-

ticated as its *Winword* cousin, does a good job of replicating the same basic functions. It begins by setting ECHO OFF, to prevent you from seeing all the commands as they are being entered.

This accomplished, the Options menu

is accessed to turn on all nonprinting symbols. A bookmark called "HERE" is created so that when the macro ends, the cursor can return to where you started. The cursor is moved to the top of the document, and a search is made downward through the text for two consecutive spaces. Four If statements qualify the search condition by changing the found state (LOG=1) to not found (LOG=0) if a period, colon, question mark, or exclamation point is to the left of the two found spaces. Then the cursor is moved to the extra space, and you are prompted to delete the space or skip it. (The Enter key symbol is made up of the ASCII characters ^ and _ , created by holding down Alt and tapping 17 on your numeric keyboard and then Alt-217.) If you tap the Enter key, the space is deleted and the cursor is repositioned to renew the search. The search is repeated (Shift-F4, *Word*'s command to repeat the last search action) and the process repeats from the While statement. Should you press a character before you tap Enter at the prompt, the search continues. When no more spaces are found, the cursor returns to and deletes the bookmark. Then the screen is returned to its normal state of not showing nonprinting symbols.

So that *WordPerfect* 5.1 users won't feel left out, I created the REMOVESP.WPM macro shown in Figure 3. This macro was built using the same basic ideas and structures as the two macros created by Mr. Hobart. Like his macros, REMOVESP.WPM uses a "bookmark" code for the cursor to return to when the macro ends. Characters are assigned as variables to watch for in the context of an If statement, and the macro pauses for input (Y or N) from the user. Since *WordPerfect*, unlike its Microsoft counterparts, does not have an edit screen for a graphical or nonprinting character mode, there's no need to set the screen to draft mode.

TIPS FROM WORKING WORDSMITHS

Tell the Working Word your latest word processing discovery; we'll pay you \$50 for any tip we print. Please send your contribution on-disk, along with a print-out, to The Working Word, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see the PC MagNet News page immediately following the Utilities column for access instructions).

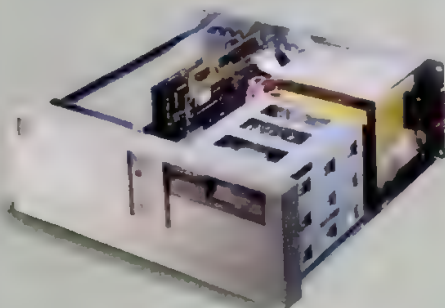
The Ultimate Business Computers

INTRODUCING THE CLUB FALCON ARCHITECTURE — THE LATEST IN UPGRADABLE TECHNOLOGY

It's time to say goodbye to obsolescence. With CLUB's Falcon Architecture™, you can keep abreast with technology by upgrading to the power that the fastest, newest microprocessor has to offer. All you need to do is change a card the same way you would any video card. It's just that simple. There's no need to set any jumpers or rerun any setup program. The Falcon Architecture offers you the most logical, and yet the simplest upgrade available in the market. Preparing for the future has never been easier. Nor has buying the right computer. You can be sure that the computer you buy today can meet your needs tomorrow. With CLUB's Falcon Series systems, you are guaranteed that technological obsolescence becomes a thing of the past.

CLUB's systems have won numerous awards from major industry publications. We named them the "Blue Ribbon Champions."

Call today and find out how CLUB's ultimate business computers can work for you.



FALCON 386/25



FALCON 386/33



FALCON 386/40



FALCON 486/25



FALCON 486/33



FALCON 486SX/20

See us at the Las Vegas Hilton

COMDEX/Fall '91

October 21-25, 1991
Las Vegas, Nevada

CLUB 486/33

- ◆ 80486™/33 processor
- ◆ 64K cache RAM*
- ◆ 4MB memory
- ◆ 1.2 and 1.44MB floppy drive
- ◆ 200MB 16ms hard drive
- ◆ Video caching and shadowing
- ◆ Super VGA card
- ◆ 14" 1024x768 color monitor
- ◆ 1 parallel & 2 serial ports
- ◆ 101-key tactile keyboard
- ◆ DOS 5.0 and Windows
- ◆ Tower case available
- ◆ Performance 15.2 MIPS



\$3615

CLUB 486/25

- ◆ 80486™/25 processor
- ◆ 64K cache RAM*
- ◆ 4MB memory
- ◆ 1.2 and 1.44MB floppy drive
- ◆ 200MB 16ms hard drive
- ◆ Video caching and shadowing
- ◆ Super VGA card
- ◆ 14" 1024x768 color monitor
- ◆ 1 parallel & 2 serial ports
- ◆ 101-key tactile keyboard
- ◆ DOS 5.0 and Windows
- ◆ Tower case available
- ◆ Performance 11.4 MIPS



\$3415

CLUB 486SX/20

- ◆ 80486SX™/20 processor
- ◆ 64K cache RAM*
- ◆ 4MB memory
- ◆ 1.2 and 1.44MB floppy drive
- ◆ 100MB 16ms hard drive
- ◆ Video caching and shadowing
- ◆ Super VGA card
- ◆ 14" 1024x768 color monitor
- ◆ 1 parallel & 2 serial ports
- ◆ 101-key tactile keyboard
- ◆ DOS 5.0 and Windows
- ◆ Tower case available
- ◆ Performance 8.9 MIPS



\$2795

CLUB 386/40

- ◆ Am386™/40 processor
- ◆ 64K cache RAM*
- ◆ 4MB memory
- ◆ 1.2 and 1.44MB floppy drive
- ◆ 100MB 17ms hard drive
- ◆ Video shadowing
- ◆ Super VGA card
- ◆ 14" 1024x768 color monitor
- ◆ 1 parallel & 2 serial ports
- ◆ 101-key tactile keyboard
- ◆ DOS 5.0 and Windows
- ◆ Tower case available
- ◆ Performance 10.0 MIPS



\$2695

CLUB 386/33

- ◆ 80386™/33 processor
- ◆ 64K cache RAM*
- ◆ 4MB memory
- ◆ 1.2 and 1.44MB floppy drive
- ◆ 100MB 17ms hard drive
- ◆ Video shadowing
- ◆ Super VGA card
- ◆ 14" 1024x768 color monitor
- ◆ 1 parallel & 2 serial ports
- ◆ 101-key tactile keyboard
- ◆ DOS 5.0 and Windows
- ◆ Tower case available
- ◆ Performance 8.3 MIPS



\$2485
\$2295

CLUB 386SX/16

- ◆ 80386SX™/16 processor
- ◆ 2MB memory
- ◆ 1.2 and 1.44MB floppy drive
- ◆ 50MB 17ms hard drive
- ◆ BIOS shadowing
- ◆ On-board IDE interface
- ◆ Super VGA card
- ◆ 14" 1024x768 color monitor
- ◆ 1 parallel & 2 serial ports
- ◆ 101-key tactile keyboard
- ◆ DOS 5.0 and Windows
- ◆ Small foot-print case



\$1495
\$1595
\$1695

CLUB'S BLUE RIBBON SYSTEMS INCLUDE:

- ◆ Free GE on-site service
- ◆ Free Windows and DOS 5.0
- ◆ Free serial mouse
- ◆ Free full 1 year warranty
- ◆ Same day shipping
- ◆ 30 days money back guarantee
- ◆ 24-hour fax line
- ◆ Free lifetime on-line technical support
- ◆ Leasing program available



Call for Corporate, Government/Educational, and VAR discounts pricing.

GSA# GS00K90AGS5260

In the Continental USA, Hawaii, and Alaska call toll-free:

800.368.3288

FAX: (510) 490-2687

International pricing call: (510) 683-6630

In Canada call CLUB Canada, Toronto: (416) 609-8121

Call for the latest low prices. For more information and free catalog call CLUB today.

CLUB
Computer Corporation

HOURS: MON—FRI
7:00 a.m.—5:00 p.m. PST
Established 1986

Direct Marketing Division

800951, 800952, 800953, 800954, 800955, 800956, 800957, 800958, 800959, 800960, 800961, 800962, 800963, 800964, 800965, 800966, 800967, 800968, 800969, 800970, 800971, 800972, 800973, 800974, 800975, 800976, 800977, 800978, 800979, 800980, 800981, 800982, 800983, 800984, 800985, 800986, 800987, 800988, 800989, 800990, 800991, 800992, 800993, 800994, 800995, 800996, 800997, 800998, 800999, 800000, 800001, 800002, 800003, 800004, 800005, 800006, 800007, 800008, 800009, 800010, 800011, 800012, 800013, 800014, 800015, 800016, 800017, 800018, 800019, 800020, 800021, 800022, 800023, 800024, 800025, 800026, 800027, 800028, 800029, 800030, 800031, 800032, 800033, 800034, 800035, 800036, 800037, 800038, 800039, 800040, 800041, 800042, 800043, 800044, 800045, 800046, 800047, 800048, 800049, 800050, 800051, 800052, 800053, 800054, 800055, 800056, 800057, 800058, 800059, 800060, 800061, 800062, 800063, 800064, 800065, 800066, 800067, 800068, 800069, 800070, 800071, 800072, 800073, 800074, 800075, 800076, 800077, 800078, 800079, 800080, 800081, 800082, 800083, 800084, 800085, 800086, 800087, 800088, 800089, 800090, 800091, 800092, 800093, 800094, 800095, 800096, 800097, 800098, 800099, 800100, 800101, 800102, 800103, 800104, 800105, 800106, 800107, 800108, 800109, 800110, 800111, 800112, 800113, 800114, 800115, 800116, 800117, 800118, 800119, 800120, 800121, 800122, 800123, 800124, 800125, 800126, 800127, 800128, 800129, 800130, 800131, 800132, 800133, 800134, 800135, 800136, 800137, 800138, 800139, 800140, 800141, 800142, 800143, 800144, 800145, 800146, 800147, 800148, 800149, 800150, 800151, 800152, 800153, 800154, 800155, 800156, 800157, 800158, 800159, 800160, 800161, 800162, 800163, 800164, 800165, 800166, 800167, 800168, 800169, 800170, 800171, 800172, 800173, 800174, 800175, 800176, 800177, 800178, 800179, 800180, 800181, 800182, 800183, 800184, 800185, 800186, 800187, 800188, 800189, 800190, 800191, 800192, 800193, 800194, 800195, 800196, 800197, 800198, 800199, 800200, 800201, 800202, 800203, 800204, 800205, 800206, 800207, 800208, 800209, 800210, 800211, 800212, 800213, 800214, 800215, 800216, 800217, 800218, 800219, 800220, 800221, 800222, 800223, 800224, 800225, 800226, 800227, 800228, 800229, 800230, 800231, 800232, 800233, 800234, 800235, 800236, 800237, 800238, 800239, 800240, 800241, 800242, 800243, 800244, 800245, 800246, 800247, 800248, 800249, 800250, 800251, 800252, 800253, 800254, 800255, 800256, 800257, 800258, 800259, 800260, 800261, 800262, 800263, 800264, 800265, 800266, 800267, 800268, 800269, 800270, 800271, 800272, 800273, 800274, 800275, 800276, 800277, 800278, 800279, 800280, 800281, 800282, 800283, 800284, 800285, 800286, 800287, 800288, 800289, 800290, 800291, 800292, 800293, 800294, 800295, 800296, 800297, 800298, 800299, 800300, 800301, 800302, 800303, 800304, 800305, 800306, 800307, 800308, 800309, 800310, 800311, 800312, 800313, 800314, 800315, 800316, 800317, 800318, 800319, 800320, 800321, 800322, 800323, 800324, 800325, 800326, 800327, 800328, 800329, 800330, 800331, 800332, 800333, 800334, 800335, 800336, 800337, 800338, 800339, 800340, 800341, 800342, 800343, 800344, 800345, 800346, 800347, 800348, 800349, 800350, 800351, 800352, 800353, 800354, 800355, 800356, 800357, 800358, 800359, 800360, 800361, 800362, 800363, 800364, 800365, 800366, 800367, 800368, 800369, 800370, 800371, 800372, 800373, 800374, 800375, 800376, 800377, 800378, 800379, 800380, 800381, 800382, 800383, 800384, 800385, 800386, 800387, 800388, 800389, 800390, 800391, 800392, 800393, 800394, 800395, 800396, 800397, 800398, 800399, 800400, 800401, 800402, 800403, 800404, 800405, 800406, 800407, 800408, 800409, 800410, 800411, 800412, 800413, 800414, 800415, 800416, 800417, 800418, 800419, 800420, 800421, 800422, 800423, 800424, 800425, 800426, 800427, 800428, 800429, 800430, 800431, 800432, 800433, 800434, 800435, 800436, 800437, 800438, 800439, 800440, 800441, 800442, 800443, 800444, 800445, 800446, 800447, 800448, 800449, 800450, 800451, 800452, 800453, 800454, 800455, 800456, 800457, 800458, 800459, 800460, 800461, 800462, 800463, 800464, 800465, 800466, 800467, 800468, 800469, 800470, 800471, 800472, 800473, 800474, 800475, 800476, 800477, 800478, 800479, 800480, 800481, 800482, 800483, 800484, 800485, 800486, 800487, 800488, 800489, 800490, 800491, 800492, 800493, 800494, 800495, 800496, 800497, 800498, 800499, 800500, 800501, 800502, 800503, 800504, 800505, 800506, 800507, 800508, 800509, 800510, 800511, 800512, 800513, 800514, 800515, 800516, 800517, 800518, 800519, 800520, 800521, 800522, 800523, 800524, 800525, 800526, 800527, 800528, 800529, 800530, 800531, 800532, 800533, 800534, 800535, 800536, 800537, 800538, 800539, 800540, 800541, 800542, 800543, 800544, 800545, 800546, 800547, 800548, 800549, 800550, 800551, 800552, 800553, 800554, 800555, 800556, 800557, 800558, 800559, 800560, 800561, 800562, 800563, 800564, 800565, 800566, 800567, 800568, 800569, 800570, 800571, 800572, 800573, 800574, 800575, 800576, 800577, 800578, 800579, 800580, 800581, 800582, 800583, 800584, 800585, 800586, 800587, 800588, 800589, 800590, 800591, 800592, 800593, 800594, 800595, 800596, 800597, 800598, 800599, 800600, 800601, 800602, 800603, 800604, 800605, 800606, 800607, 800608, 800609, 800610, 800611, 800612, 800613, 800614, 800615, 800616, 800617, 800618, 800619, 800620, 800621, 800622, 800623, 800624, 800625, 800626, 800627, 800628, 800629, 800630, 800631, 800632, 800633, 800634, 800635, 800636, 800637, 800638, 800639, 800640, 800641, 800642, 800643, 800644, 800645, 800646, 800647, 800648, 800649, 800650, 800651, 800652, 800653, 800654, 800655, 800656, 800657, 800658, 800659, 800660, 800661, 800662, 800663, 800664, 800665, 800666, 800667, 800668, 800669, 800670, 800671, 800672, 800673, 800674, 800675, 800676, 800677, 800678, 800679, 800680, 800681, 800682, 800683, 800684, 800685, 800686, 800687, 800688, 800689, 800690, 800691, 800692, 800693, 800694, 800695, 800696, 800697, 800698, 800699, 800700, 800701, 800702, 800703, 800704, 800705, 800706, 800707, 800708, 800709, 800710, 800711, 800712, 800713, 800714, 800715, 800716, 800717, 800718, 800719, 800720, 800721, 800722, 800723, 800724, 800725, 800726, 800727, 800728, 800729, 800730, 800731, 800732, 800733, 800734, 800735, 800736, 800737, 800738, 800739, 800740, 800741, 800742, 800743, 800744, 800745, 800746, 800747, 800748, 800749, 800750, 800751, 800752, 800753, 800754, 800755, 800756, 800757, 800758, 800759, 800760, 800761, 800762, 800763, 800764, 800765, 800766, 800767, 800768, 800769, 800770, 800771, 800772, 800773, 800774, 800775, 800776, 800777, 800778, 800779, 800780, 800781, 800782, 800783, 800784, 800785, 800786, 800787, 800788, 800789, 800790, 800791, 800792, 800793, 800794, 800795, 800796, 800797, 800798, 800799, 800800, 800801, 800802, 800803, 800804, 800805, 800806, 800807, 800808, 800809, 800810, 800811, 800812, 800813, 800814, 800815, 800816, 800817, 800818, 800819, 800820, 800821, 800822, 800823, 800824, 800825, 800826, 800827, 800828, 800829, 800830, 800831, 800832, 800833, 800834, 800835, 800836, 800837, 800838, 800839, 800840, 800841, 800842, 800843, 800844, 800845, 800846, 800847, 800848, 800849, 800850, 800851, 800852, 800853, 800854, 800855, 800856, 800857, 800858, 800859, 800860, 800861, 800862, 800863, 800864, 800865, 800866, 800867, 800868, 800869, 800870, 800871, 800872, 800873, 800874, 800875, 800876, 800877, 800878, 800879, 800880, 800881, 800882, 800883, 800884, 800885, 800886, 800887, 800888, 800889, 800890, 800891, 800892, 800893, 800894, 800895, 800896, 800897, 800898, 800899, 800900, 800901, 800902, 800903, 800904, 800905, 800906, 800907, 800908, 800909, 800910, 800911, 800912, 800913, 800914, 800915, 800916, 800917, 800918, 800919, 800920, 800921, 800922, 800923, 800924, 800925, 800926, 800927, 800928, 800929, 800930, 800931, 800932, 800933, 800934, 800935, 800936, 800937, 800938, 800939, 800940, 800941, 800942, 800943, 800944, 800945, 800946, 800947, 800948, 800949, 800950, 800951, 800952, 800953, 800954, 800955, 800956, 800957, 800958, 800959, 800960, 800961, 800962, 800963, 800964, 800965, 8

by
Neil J. Rubenking

User-to-User

NO PRINTER? NO PROBLEM!

When a program directs output to a non-existent printer, the computer stops what it's doing while the BIOS tries to print. There's a byte in the BIOS data area for each printer that tells how many times to retry that printer. The default is 20, but you can get a faster response if you lower this number. Figure 1 is a DEBUG script that creates NOWAIT.COM, a program that changes the number of retries to 1 for LPT1. The number of retries is the 01 at the end of the seventh line. You can raise this to a higher number, but be sure not to make it 0 or the system will keep trying forever.

You can also modify the printer selection. Just change the 0078 at the end of the 5th line of the script, to 0079 for LPT2, 007A for LPT3, or 007B for LPT4. This program is useful even on a system that does have a printer—it keeps the keyboard from locking up if the printer isn't turned on.

A related program disables the print-screen function. The DEBUG script in Figure 2 creates NOPRSCR.COM. This program simply tells DOS that a print-screen is already in progress, preventing another from taking place. A similar program, PRSCR.COM, will reenables screen printing. To create a script for it, modify NOPRSCR.SCR by changing the 01 at

- **NO PRINTER? NO PROBLEM!** Avoid pointless pauses when programs attempt to print to a nonexistent printer.
- **COUNT ON IT:** Sequential numbering with a DOS batch file.

the end of the seventh line to a 00. Of course, you'll need to change the filename as well.

Greg Smith
Baltimore, Maryland

 I'm installing NOWAIT.COM on my laptop immediately. It's such a simple thing, I wish I'd thought of doing it before. NOPRSCR will go into my AUTOEXEC.BAT too. I love lying to DOS! NOPRSCR takes advantage of the fact that DOS disables the print-screen function itself *during* the process of printing the screen. It does so by setting a particular bit in low memory and clearing it when the screen printing is finished. NOPRSCR simply sets that bit and leaves it set.

To create programs from the scripts above, simply redirect them into DEBUG, for example

```
DEBUG < NOWAIT.SCR
```

If you see any error messages, double-check your script file and give it another try. You should note that an old command line utility called DOSEDIT will cause *every* line in a DEBUG script to return an error message. If that happens to you, just replace DOSEDIT with a more modern utility, perhaps *PC Magazine's* own CMDEDIT!

COUNT ON IT

Some time ago I wrote CHANGEJ.BAT (shown in Figure 3), which can count (forward and backward) using environment variables. I use this batch file for two purposes: generating unique filenames (LETTER.001, LETTER.002, and so on), and for controlling a directory stack, using the variable as a stack pointer. The processing speed is not lightning fast, but since this is a special-purpose routine, that's not too important.

There are two aspects to this batch file I think you'll find interesting: the use of "double" labels and the recursion (the file calls itself).

At present, the counting starts with 001 whenever the system is booted. It wouldn't be difficult, though, to record the current value of the variable in another batch file. Then, if that file is called by your AUTOEXEC, counting could continue properly even after rebooting. I've included another file CNT.BAT (Figure 4) to demonstrate CHANGEJ.BAT.

J.O. Stolley
Netherlands

 Note first of all that you must not call CHANGEJ.BAT until you've already initialized the environment variables H, T, and U (hundreds, tens, and units). Each variable must contain a digit from 0 to 9. If you start using the routine

NOWAIT.SCR COMPLETE LISTING

```
A 100
MOV AX,0040
PUSH AX
POP ES
MOV DI,0078
ES:
MOV BYTE PTR [DI],01
MOV AH,4C
INT 21

RCX
IW
N NOWAIT.COM
W
Q
```



Figure 1: This script sets the number of times your system will try to print to LPT1 to 1—the minimum.

NOPRSCR.SCR COMPLETE LISTING

```
A 100
MOV AX,0050
PUSH AX
POP ES
MOV DI,0000
ES:
MOV BYTE PTR [DI],01
MOV AH,4C
INT 21

RCX
IB
N NOPRSCR.COM
W
Q
```



Figure 2: Run NOPRSCR.COM, produced by this script, to disable the print-screen function.

CHANGEJ.BAT COMPLETE LISTING

```
@echo off
REM Calling is done via:
REM CALL CHANGEJ 8 U (increase)
REM CALL CHANGEJ 9 U (decrease)
REM Variables H, T, U must be
REM initialized to single digits.
set X=12
if %X%==U set O=%U%
if %X%==T set O=%T%
if %X%==H set O=%H%
set S=P
if %I%==9 set S=M
goto %S%
:P8
:K2
set V=1
goto Y
:P1
:K3
set V=2
goto Y
:P2
:K4
set V=3
goto Y
:P3
:K5
set V=4
goto Y
:P4
:K6
set V=5
goto Y
:P5
:K7
set V=6
goto Y
:P6
:K8
set V=7
goto Y
:P7
:K9
set V=8
goto Y
:P8
:K0
set V=9
goto Y
:P9
:K1
set V=0
:Y
set %X%=%V%
if "%X%"=="U" if %O%==01 CALL changej 01 T
if "%X%"=="T" if %O%==01 CALL changej 01 H
set J=%H%%T%%U%
for %%v in (U T H) DO set %%v=
```

Figure 3: By handling the three digits separately, CHANGEJ.BAT can raise or lower any number from 000 to 999.

on a regular basis, you'll probably want to put a line in your AUTOEXEC that gives these variables an initial value. If you're willing to start fresh every day, just insert the following line:

```
FOR %%v IN (U T H) DO SET %%v=0
```

However, if you're using these digits to name files, you'll want to save their current values from day to day. In that case, call SAVDIGIT.BAT (Figure 5) every

time before you shut down, and then insert a call to RSTDIGIT.BAT (which SAVDIGIT creates) in your AUTOEXEC.BAT file.

I'll note at this point that there's no error checking in CHANGEJ. You *must* pass 0 (to increment a digit) or 9 (to decrement) for the first parameter and U, T, or H for the second; results are unpredictable with any other input.

CHANGEJ.BAT is a complicated batch file that uses a number of e-vars (environment variables). To see how it works, let's trace its response to several different situations. First, we'll assume that the variables H, T, and U contain 0, 0, and 8 respectively. We call the batch file with the command CHANGEJ 0 U, which should have the effect of adding 1 to the units digit.

First, the program sets the local e-var X to the second command line parameter, U in this case. Then it sets the e-var O to the value of the e-var named by X. U has a value of 8, so that's the value inserted into O. The e-var S is set to the value P, and since the first parameter was not 9, it keeps that value.

The next line in the batch file is the double label the author referred to. It's composed of the value of S followed by the value of O. In this case, that translates to GOTO P8. So we travel to label P8, then reach a line that sets yet another e-var V to the value 9. Next we jump to the label Y and continue processing.

At label Y, the line set %X%=%V% sets the variable whose name is contained in X to the value of V. In this case, it sets U to the new value 9. Neither of the IF conditions on the next two lines is true, so we build the variable J from the H, T, and U variables and clear out all the local variables. The new value of J is 009.

Suppose we now give the command CHANGEJ 0 U again. The process starts off the same way. We jump to the double label P9 instead of P8, which means that variable U gets set to 0. But now we come to a change; one of the IF tests is true. Variable X does have the value U, and variable U does have the same value as the first command line parameter. That means we call CHANGEJ again, to add one to the T variable. After the second call to CHANGEJ, variable J contains 010, which is one more than 009.

Finally, we'll try the command CHANGEJ 9 U. This time, the variable S gets set to M, and we jump to the label M0. That puts a 9 in the U variable, which

CNT.BAT COMPLETE LISTING

```
@echo off
REM CNT.bat to demonstrate
REM CHANGEJ.bat
REM =====
for %%v in (U T H) DO set %%v=0
cls
echo This routine counts from 1 to
echo 12 and then backwards from 12
echo to 1. This is achieved using
echo DOS statements only. It sets
echo a variable J which may be used
echo for stack-handling. The range
echo of J is 000 thru 999, but can
echo be enlarged easily.
echo.
echo Hit any key to go on ...
pause >nul
cls
:INCR
CALL changej 0 U
echo %J%
if not %J%==012 goto INCR
:DECR
CALL changej 9 U
echo %J%
if not %J%==001 goto DECR
:J
for %%v in (U T H J) DO set %%v=
```

Figure 4: This batch file counts from 001 to 012 and back down again using CHANGEJ.BAT (see Figure 3).

SAVDIGIT.BAT COMPLETE LISTING

```
@ECHO OFF
ECHO SET U=%U% > RSTDIGIT.BAT
ECHO SET T=%T% >> RSTDIGIT.BAT
ECHO SET H=%H% >> RSTDIGIT.BAT
```

Figure 5: If you run SAVDIGIT.BAT before you turn off or reboot your system, you can restore the values of the three-digit variables simply by calling RSTDIGIT.BAT.

matches the first command line parameter. Again the first IF test is true, so we call CHANGEJ again to subtract one from the T variable. After this call, variable J correctly contains 009 again.

CHANGEJ.BAT isn't fast, that's certainly true. But for applications like numbering files sequentially, speed isn't a requirement.

SHARE YOUR SECRETS

Reveal your latest DOS and systems discoveries through User-to-User; we'll pay you \$50 for any submission we print. Please submit your letter on a disk together with a printout. Mail your contribution to User-to-User, PC Magazine, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 10 for access instructions). We regret that we cannot acknowledge submissions or answer letters individually.

by
Jeff Prosize

Tutor

TROUBLESHOOT DOS 5.0 USING README.TXT

By now you've had the time to install DOS 5.0 on your system and look it over. Whatever you do, be sure to peruse the README.TXT file that DOS 5.0 places in the DOS directory of your hard disk. This file contains a treasure trove of helpful information that can cure a variety of ills plaguing the latest version of DOS.

One of the goodies hidden away in README.TXT is the documentation for the SWITCHES directive's /W switch. (SWITCHES is one of the 15 CONFIG.SYS directives supported in DOS 5.0.) Your DOS manual documents the /K switch, which causes DOS to treat an Enhanced keyboard like a regular keyboard, but it fails to mention /W.

The /W switch concerns the WINA20.386 file, which SETUP places in the root directory of your hard disk. WINA20.386 is a driver that *Microsoft Windows* 3.0 uses when it runs under DOS 5.0 in 386 Enhanced mode. If for some reason you placed WINA20.386 in a directory other than the root, the /W switch enables *Windows* to locate it.

At start-up, *Windows* looks for WINA20.386 in the root directory of the drive you booted from. If it can't find the file, *Windows* pops up the error message "You must have the file WINA20.386 in the root of your boot drive to run *Windows* in Enhanced Mode." To correct this error, place the statement

```
SWITCHES=/W
```

in your CONFIG.SYS file. Then add a DEVICE= statement to the [386Enh] section of *Windows*' SYSTEM.INI file. This step tells *Windows* where WINA20.386 is located. For example, if you copied WINA20.386 to the \WINDOWS directory of the D: drive, you should add the following statement to SYSTEM.INI

```
DEVICE=D:\WINDOWS\WINA20.386
```

- **TROUBLESHOOT DOS 5.0 USING README.TXT:** README.TXT offers a spate of information about useful switches that the manual covered scantily or not at all.
- **LONGER PATH STRINGS:** An old trick lets you skirt the 127-character limit for PATH statements.

and then restart *Windows*. This time, *Windows* should come up in 386 Enhanced mode without complaint.

If *Windows* displays the error message "Cannot find a device file that may be needed to run *Windows* in 386 Enhanced Mode; Run Setup again," check the DEVICE= statement for typos and make sure both the filename and the path to the file are correct.

Another useful switch that README.TXT documents (and the manual fails to mention at all) is the EMM386.EXE driver's /Y switch. When *Windows* is started in 386 Enhanced mode and it discovers that DOS 5.0's EMM386.EXE driver is installed, it looks for the image of the driver on-disk in the location *Windows* was originally loaded from. For example, if your CONFIG.SYS file contains the statement

```
DEVICE=C:\DOS\EMM386.EXE NOEMS
```

Windows looks for EMM386.EXE in the \DOS directory of the C: drive. A problem can arise, however, if the location of EMM386.EXE changes. (The location might change, for example, if you boot DOS 5.0 from a floppy that contains EMM386.EXE and then remove the floppy.) If *Windows* can't find the file, it displays the message "Unable to start

Enhanced Mode *Windows* due to invalid path specification for EMM386" and then it aborts. You can skirt this problem by using the EMM386.EXE driver's /Y switch, which tells *Windows* where it should look for EMM386.EXE.

Let's say you boot from a floppy that contains a copy of EMM386.EXE. Suppose that there is also a copy of EMM386.EXE in the \DOS directory of drive C:. Moreover, suppose that the floppy's CONFIG.SYS file contains the statement

```
DEVICE=EMM386.EXE NOEMS
```

All you have to do to fix this is amend the line to read

```
DEVICE=EMM386.EXE NOEMS  
/Y=C:\DOS\EMM386.EXE
```

After you reboot, the problem will go away.

Incidentally, you can also solve the problem by changing the line that loads EMM386.EXE to

```
DEVICE=C:\DOS\EMM386.EXE
```

Since EMM386.EXE is loaded from C:\DOS to start with, *Windows* will automatically go back to that location when it needs to read the file again.

One interesting item that you won't find documented in either the README.TXT file or the DOS manual is the way DOS uses the TEMP environment variable. Actually, this feature is given fleeting mention in the DOS manual, but only in an indirect way that doesn't divulge its true purpose.

Here's a bit more detail. When you pipe output from one DOS command to another, DOS stores the output in a pair of temporary files that are deleted as soon as the operation is complete. The TEMP environment variable determines where these files are created. To get a clearer picture, go to a hard disk directory that

Tutor

contains no files and type

```
SET TEMP= DIR | MORE
```

The first command deletes the TEMP environment variable if it was defined; the second one pipes the output from DIR to the MORE filter. In the directory listing that ensues, you should see a pair of files with nonsensical names and 0 bytes. Those are the files that DOS created to store the piped output. Now type

```
SET TEMP=C:\DOS
```

(assuming that drive C: contains a directory named \DOS) and type DIR | MORE again. This time, you won't see the temporary files, because they were created in the \DOS directory rather than in the current directory.

There's no rule that says which directories temporary files should or should not be stored in. However, most users prefer to store them in an empty directory, such as C:\DOS\TEMP, specially created for that purpose. In previous DOS versions, temporary files were created in the root directory of the current drive.

What else does README.TXT offer? For starters, it contains specific instructions for installing DOS 5.0 on hard disks that were partitioned with third-party disk managers such as OnTrack Computer Systems' *Disk Manager* or Storage Dimensions' *SpeedStor*. The file also contains information on BIOSes that are incompatible with DOS 5.0 and on mouse driver versions required by the DOS Shell. (For example, if you use a driver for a Logitech mouse, it must be Version 5.01 or later; for the Microsoft Mouse, you must use Version 6.21 or later.) README.TXT even contains helpful hints. For example, you'll learn that if you're using a Hercules card, you must run the utility MSHERC before starting QBasic or the DOS Editor.

README.TXT is not the only supplement that you should look at. There's another file named APPNOTES.TXT, which contains information about the behavior of certain application programs in the DOS 5.0 environment. APPNOTES.TXT states that to run *Lotus 1-2-3* 3.0 in the DOS Shell with task swapping enabled, you must set the XMS

Memory KB Required field of the Advanced dialog box to 384. Otherwise, the Shell may try to launch 1-2-3 without sufficient extended memory available.

LONGER PATH STRINGS

How can I create a PATH string that is longer than 127 characters? Increasing the size of the environment DOS sets up in low memory doesn't do it, even though the PATH string is stored as an environment variable. I also had no luck entering a long PATH statement in a batch file (where lines can be longer than 127 characters). Any advice?

Douglas G. Larson
Bellevue, Washington



DOS veterans often rely on an old trick to circumvent the limit on the length of PATH strings. The procedure has been printed many times, but it's so useful that it bears repeating.

This trick uses the SUBST command to establish drive-letter aliases for the directories you place in a PATH statement, and it supplies the drive letters rather than the actual directory names to the PATH command. To illustrate, suppose you want to include the directories C:\DOS, C:\WINDOWS, C:\SYSTEM, and C:\UTIL in your PATH. Normally, you'd do the job with this statement:

```
PATH C:\DOS;C:\WINDOWS;C:\SYSTEM  
;C:\UTIL
```

However, you could accomplish the same thing with the statements

```
SUBST W: C:\DOS  
SUBST X: C:\WINDOWS  
SUBST Y: C:\SYSTEM  
SUBST Z: C:\UTIL  
PATH W:\;X:\;Y:\;Z\
```

See the difference? Functionally, these two methods are the same; once you execute the command SUBST W: C:\DOS, for example, you can access the DOS directory on the C: drive either by name or by the drive letter W:. However, the latter method creates a PATH string that's only 15 characters long. By comparison, spelling out the directory names in full first requires 35 bytes. The longer the pathnames, the more you save, because SUBST reduces a pathname to a single drive letter no matter what the length of the pathname.

The SUBST command was added to

DOS in Version 3.1 for the benefit of DOS 1.x-vintage application programs that were not designed to work with sub-directories. By equating drive letters with directory names, you can fool such programs into thinking that they're dealing with physical drives.

There's one possible glitch you should be aware of. By default, DOS reserves room for only five logical drives, which it assigns the letters A: through E:. To use the SUBST commands shown above, you'll have to add the statement

```
LASTDRIVE=Z
```

to your CONFIG.SYS file. Each additional drive letter you reserve room for requires 88 bytes of memory, so to economize on memory, you should set LASTDRIVE to the lowest drive letter necessary. For example, if the highest logical drive defined in your system is drive D: and you need space to define six additional drives with the SUBST command, modify the LASTDRIVE directive in CONFIG.SYS to read

```
LASTDRIVE=J
```

Then you can use SUBST to set up drives E: through J:. If you're curious to see how SUBST goes about establishing drive aliases, refer back to the August 1991 issue. Look at "Current Directory Structures," which discusses the data structures that DOS uses to store information about logical drives and the effect that the SUBST command has on them. Also note that SUBST has a direct counterpart: the JOIN command. Where SUBST creates an alias for a directory in the form of a drive letter, JOIN creates an alias for a drive in the form of a directory name. But while SUBST can come in handy in many ways, you'll find that JOIN is far and away one of the least useful of all the DOS commands.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for access instructions). We regret that we can't acknowledge submissions or answer questions individually. ■

Big Business Productivity For Small Workgroups



- * Pop-up Menu & Windows Option
- * Easy to Install and Use
- * Rapid Data Transfer
- * User Upgradable Memory
- * Reliable Automatic Switching
- * No PC RAM Memory Required
- * Toll-Free Technical Support
- * 45-Day Money-Back Guarantee



Printer Sharing Solutions

Model Name	Total Ports	PCs/ Printers	Memory Available	Printer Selection	Price \$ / Buffer
SL	10 6 Ser., 4 Par.	Any Combination	256KB - 4MB	Pop-up Menu	\$495 / 256KB \$595 / 1MB
SLP	10 8 Par., 2 Ser.	Any Combination	256KB - 4MB	Pop-up Menu	\$495 / 256KB \$595 / 1MB
HXM	4 2 Ser., 2 Par.	Any Combination	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
HXS	4 Serial	Any Combination	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
HWP	5 Parallel	3/2 4/1	256KB - 16MB	Pop-up or Buttons	\$295 / 256KB \$395 / 1MB
HXP	4 Parallel	2/2 3/1	256KB - 16MB	Pop-up or Buttons	\$245 / 256KB \$345 / 1MB
HCP	2 Parallel	1/1	256KB - 16MB	One Printer	\$225 / 256KB \$325 / 1MB
AS-41	5 Parallel	4/1	None	One Printer	\$195
AS-31	4 Parallel	3/1	None	One Printer	\$175

Save Money by Sharing Office Resources:

Printers and other expensive peripherals are idle the vast majority of the time. Buffalo boxes facilitate efficient utilization of these devices, and reduce the need to purchase more of them.

Buffalo boxes further improve productivity by allowing easy user access to all shared peripherals. With a buffer, all users can simultaneously send print data and quickly release their PCs to continue working.

BUFFALO

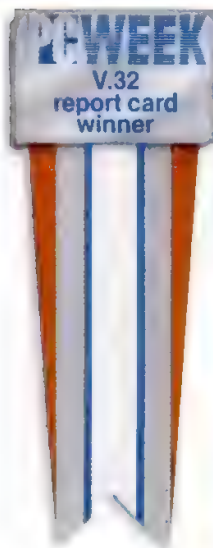
US and Canada Toll-Free:
(800) 345-2356

Fax (503) 585-4505

Buffalo Products, Inc.

2805 19th St. SE, Salem, OR 97302-1520

UDS V.32 Modems: winners at 19.2 kbps—now FastTalk doubles the speed



From the day of its introduction, UDS' V.32 modem has gathered honors from leading computer publications and other industry watchers!

Initially it set the standard for 9.6 kbps, full-duplex traffic over dial-up lines. When MNP[®] level 5 data compression was added, throughput went to 19.2 kbps.

Now comes the FastTalk V.32/42b — a modem that is specifically designed for PC applications and is fully compliant with CCITT's V.42bis recommendation. Meeting this standard gives the V.32/42b a maximum data rate of 38.4 kbps!

The modem is particularly useful for bit-intensive data transfers, such as engineering graphics, image processing and complex financial operations. Data Rate is automatically adjusted to 9600, 4800, 2400 or 300 bps (CCITT V.32 and V.22bis). At the 9600 bps rate, trellis coding gives the FastTalk V.32/42b an exceptionally high tolerance for noisy lines.

For accurate communication over worst-case lines, the unit incorporates V.42 LAP-M and MNP 4 error control functions. A full complement of on-board test functions is included, and eight LEDs provide easy monitoring of the unit's operation and built-in diagnostic features.

Get acquainted with the latest winner in the UDS V.32 family. For the distributor nearest you, contact UDS at 800/451-2369 (in Alabama, 205/430-8000); FAX 205/430-8926.

MNP[®] is a registered trademark of Microcom Systems, Inc.
Created by Dayner/Hall, Inc., Winter Park, Florida



by
Frank J. Derfler, Jr.

Connectivity

AMATEUR ALERT

Your column in the June 25, 1991, issue described a code-free amateur radio license people can obtain to use the *packet radio* technique to network their PCs and pass data. You should have pointed out that it is illegal for even licensed amateur radio operators to use their radio transmissions for business purposes.

Elmer Laudenslager
Williamsport, Pennsylvania



Good point! Interested users should also note that the FCC does not differentiate between profit and not-for-profit business. That's why they call it *amateur* radio.

LINKING TWO COMPUTERS

Several years ago I purchased a Compaq luggable with two floppy disk drives. Recently I moved up to an Austin 386SX/20 with an 85MB hard disk. Both my wife and I need a PC, and I'd like to connect the venerable Compaq to the younger Austin so that each machine could access the disk drives in either machine (I'll sometimes need to write to the Compaq's 360K disks from the Austin). How can I effectively (and cheaply) share the power of my new computer with the older machine? Even though the trusty Compaq would make a good boat anchor, I'm not quite ready to relegate it to that function.

Tim McCollum
Mission, Texas



You can effectively and inexpensively bridge the generation gap between your Texas PCs, as long as you're willing to give up either a parallel or serial port in each computer and some RAM.

Several years ago *PC Magazine* coined the term *zero-slot LANs* to describe the technology for interconnecting PCs via their existing parallel or serial ports (parallel connections are much faster). The PCs are linked with simple cables or telephone wire, and you don't need to add a

■ **AMATEUR ALERT:** Even licensed amateur radio operators can't use radios for business.

■ **LINKING TWO COMPUTERS:** A little network goes a long way when you need to share disk drives.

■ **CONNECTIVITY WITH CATV:** Using cable television for wide area networking.

■ **DETERMINING THROUGHPUT:** Throughput on a LAN depends on many factors—not just the signaling speed of the cable.

■ **BBS ON A LAN:** A bulletin board on a network lets local and remote users share services.

network interface card. You can share any drives as virtual drives across the network. What this means is that the Austin computer's hard disk would appear as the C: drive on the Compaq, and the Compaq's A: drive could appear as D: on the Austin. DOS applications and command line entries can access the drives on the remote PC just as if they were installed internally.

One of the best of the zero-slot LAN products is *LANtastic/Z* by Artisoft. This full-featured network operating system links two personal computers together so that the users can share not only drives but programs, data, and printers as well—for a modest \$199. The software works just

like the regular Artisoft program for LAN adapters, and using it will prepare you to use a full network when your needs change. Call Artisoft at 602-293-6363 for more information.

CONNECTIVITY WITH CATV

In the September 10, 1991, issue there was an article focusing on wide area networking ("Linking LANs: The Media Move the Message"), where you mentioned using cable television systems for wide area networks. Our company owns its own cable television distribution system. How can we use it for data transmission?

James Walsh
via CompuServe



Applitek Corp. (508-475-4050) markets a family of products called LANcity that bridge Ethernet LANs over 6-MHz cable television (CATV) systems. The data signal takes the bandwidth of one television channel on the CATV system. The \$33,000 LANcity Starter System consists of two Ethernet bridges and a single-channel translator. Each bridge becomes a node on an Ethernet network, and the cable television system provides the interconnecting media. Other available products include an interchannel bridge that can move data packets between two CATV channels for networking flexibility and network management equipment.

The LANcity devices provide 10-megabit signaling at distances up to 35 miles. Applitek sells its LANcity products to CATV operators and systems integrators, who market the technology to schools, hospitals, and governments. Note that many cable systems are not designed for two-way transmission, so it's likely that you'll need to upgrade the CATV equipment as well as install the LANcity system. The biggest obstacle to the installation of many metropolitan area networks isn't money or equipment, it's gaining legal right-of-way. But if a CATV system exists, LANcity provides an ex-

Connectivity

cellent way to leverage its use for both television and data transmission.

DETERMINING THROUGHPUT

What is the real significance of the megabit-per-second ratings quoted for most LANs? Does a 16-megabit-per-second LAN really move data eight times as fast as a 2-megabit-per-second LAN? Would it be true to say that a 2-megabit-per-second LAN running under *NetWare* would outperform a 16-megabit-per-second Token-Ring LAN running DOS-based server software?

Michael E. Pollard
Kingston, Jamaica



The numbers typically quoted for LAN systems—10 megabits per second for Ethernet, 2.5 megabits per second for ARCnet, and either 4 or 16 megabits per second for Token-Ring—represent the signaling speed across the cable. In effect, those numbers are like the fixed speed of cable cars going up a hillside. The fixed speed gives you some measure of the fastest you can expect people to move, but people buying tickets and getting on and off all slow down the process, so the aggregate speed enjoyed by any group of riders is much lower than the cars' potential speed.

As with most generalizations, there are exceptions. You could use a technique to pack people very tightly into the cable cars to raise the overall throughput. WebCorp, for example, makes data compression available in its network operating system so that the *WEB Network Operating System* could theoretically deliver throughput faster than the signaling speed. This is the same way that compression schemes like MNP 5 and V.42bis consistently deliver throughput faster than the signaling speed of the modems.

Many factors combine to limit the throughput of a LAN to something much less than the maximum signaling speed. Your question compares DOS-based LANs with *NetWare*, so I assume the throughput you're considering includes the time needed to access files from the server's disk drive or cache. These data access times are a much larger part of the throughput equation than the signaling speed across the cable. Other factors, such as the means for controlling access to the

shared network cable and the method used to move the data between the LAN adapter cards and the CPU in both the transmitting and receiving PCs, are also more important than the signaling speed in determining throughput.

You can't characterize all DOS-based LANs as slow or as designed to service only small workgroups. Products like Artisoft's *LANtastic*, Performance Technology's *POWERlan*, and WebCorp's *WEB Network Operating System* use sophisticated disk caching and methods of quickly moving data between the PC and the adapter board. In many installations, these products can deliver throughput rivaling that of *NetWare* 2.2. So when evaluating networks, you should separate consideration of the operating system from consideration of the network cabling scheme in most cases.

**You can't characterize
all DOS-based LANs
as slow or as designed
to service only small
workgroups.**

BBS ON A LAN

I was around at the birth of the electronic bulletin board era and reported on the establishment of the first electronic bulletin board system (EBBS) in Chicago. I've been covering the expanding use of bulletin boards for several years. The hardware has evolved over the years (we used to think it was a big deal to have a 5MB hard disk on a BBS system), but the BBS architecture and the way people use the systems have not changed much since the first BBS fired up on an S-100-bus personal computer. At least, not until Mustang Software introduced distributed-processing architecture into its *Wildcat!* software.

Mustang Software has thrown a useful twist into the BBS concept by moving it onto a LAN. Not only can users calling into a BBS through modems interact on the forums and access categorized information through a controlled and orderly series of BBS menus, but people networked to the BBS computer can benefit

from the same services.

Mustang Software's *Wildcat!* BBS software can give as many as 250 users access to the bulletin board across a LAN or through the more traditional modem attachment. People at networked computers can use the BBS menus and BBS services as if they were calling in through a modem, but they use the power of their own computers to run the BBS software. You don't need to dedicate a computer to run the *Wildcat!* software unless you want to provide full-time dial-in access capabilities.

The new version of *Wildcat!* lets everyone on the network run software that opens shared BBS data and configuration files in order to customize the BBS for each person. The configuration files control the access rights and functions available to each user.

As networks grow larger, they must become more formalized to keep the files orderly and to protect data. The threat of virus infection demands even more levels of protection. A networked BBS is a perfect facility for allowing controlled access to the messages, programs, bulletins, and updates for a particular office or department.

Virus scanning and interception have been raised to a fine art on many bulletin board systems including *Wildcat!*. And even on a LAN, the Mustang software maintains its controlled environment. Ordinary programs can't read the files, and the BBS administrator controls the users and the activities as needed. The distributed architecture of the software makes it an interesting and useful tool on many corporate networks.

At \$499 for a 250-user system, *Wildcat!* is also one of the least expensive electronic mail and remote-access packages you'll find. Contact Mustang Software at 805-395-0223 for more information.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We will pay \$50 for any tip we print. Please submit your letter on a disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you can contact Frank J. Derfler, Jr., via MCI Mail (the ID number is 3103182). We regret that we are unable to acknowledge submissions or answer letters individually. ■

FastData 386 Systems



FastData 386/33 \$1899

The fastest 386 processor available combined with a 64K thirty nanosecond memory cache make the FastData 386/33 a power users dream! Included in the base price is a 80 megabyte 20 millisecond hard disk, 1024 by 768 VGA monitor and card, four megabytes of memory, and 5.25" & 3.5" high capacity floppy drives. Plus, should anything ever go wrong with your FastData computer, you are covered by a one-year warranty with free on-site service or system replacement if we cannot correct the problem with our FastSHIP advance parts replacement program.

Standard Features

- ✓ 33mhz Intel 386-DX processor.
- ✓ 64K high-speed memory cache.
- ✓ 4 megabytes high speed RAM.
- ✓ 105 mb 17ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with speed, keylock and reset buttons.
- ✓ 387-DX coprocessor socket.
- ✓ 200 watt power supply.
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 1mb Video Ram.
- ✓ Clock calendar, parallel port, game port and two serial ports.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 slots & 5 drive bays.
- ✓ Built-in memory management.
- ✓ MS-DOS 5.0.
- ✓ Windows & Mouse add \$69.
- ✓ FCC Class B approved.

386/DX33	80mb	100mb	200mb	660mb
Mono	\$1,529	\$1,599	\$1,849	\$3,199
Mono VGA	\$1,629	\$1,699	\$1,949	\$3,299
VGA 1024i	\$1,829	\$1,899	\$2,149	\$3,499
VGA 1024ni	\$1,929	\$1,999	\$2,249	\$3,599



FastData 386/25 \$1699

The optimum combination of features, expandability, and power make the FastData 386/25 an ideal choice for those whose applications demand high speed 32 bit processing and expandability. The value of the 386/25 goes far beyond its price; it comes configured with a full four megabytes of fast RAM, a quick 20 millisecond 80 megabyte hard disk, and maximum VGA displaying 1024 by 768 resolution powered by a high-output 16 bit 1mb VGA board. Also, the FastMicro team will configure your FastData 386 exactly the way you want, without sending you shopping elsewhere.

Standard Features

- ✓ 25mhz Intel 80386-DX.
- ✓ 4 megabytes of high speed RAM.
- ✓ 80 mb 18ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis or mini-tower (shown) with keylock, speed and reset buttons.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply.
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 slots & 5 drive bays.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ MS-DOS 5.0.
- ✓ Windows & Mouse add \$69.
- ✓ FCC Class B approved.

386/DX25	80mb	100mb	200mb	660mb
Mono	\$1,399	\$1,469	\$1,719	\$3,069
Mono VGA	\$1,499	\$1,569	\$1,819	\$3,169
VGA 1024i	\$1,699	\$1,769	\$2,019	\$3,369
VGA 1024ni	\$1,799	\$1,869	\$2,119	\$3,469

All FastData Systems Include:

- Toll-Free Technical Assistance for Life
- 'FastSHIP' Advance Parts Replacement
- On-Site Service or System Replacement Should Unusual Problems Arise
- 30 Day Money Back Guarantee
- FastMicro Peace of Mind

FastData 486/33

If you need the ultimate in power, the FastData 486/33 is the ideal choice. Priced at \$3099, it includes 8mb of RAM, 8K internal & 128K external cache, Super VGA Non-Interlaced Color Monitor, 1mb VGA Card, 200mb IDE Hard Drive, Dual Floppy Drives and MS-DOS 5.0.



FastData SX Systems



\$1499 *FastData SX/20*

25% faster than a 16mhz SX, the FastData SX/20 adds even greater performance to its 386 multitasking capabilities. Just \$200 more than our SX/16, this machine also includes an 80mb hard drive in addition to the super VGA color monitor and 16 bit VGA adaptor. Keytronic keyboard, DOS 4.01 or 5.0, and two floppy drives. The system includes two megabytes of memory and is expandable to eight on the main system board. Remember, when you have questions, need to solve a problem, or want recommendations on products for your system, the FastMicro team is standing by toll-free to provide product support for as long as you own your FastData personal computer.

Standard Features

- ✓ 20mhz Intel™ 386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) or mini-tower with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

386/SX20	40mb	80mb	100mb	200mb
Mono	\$1,069	\$1,199	\$1,269	\$1,519
Mono VGA	\$1,169	\$1,299	\$1,369	\$1,619
VGA Color	\$1,319	\$1,449	\$1,519	\$1,769
VGA 1024i	\$1,369	\$1,499	\$1,569	\$1,819



\$1299 *FastData 386/SX*

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and also want to run their favorite DOS applications at surprising speeds. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit super VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel™ 386-SX processor.
- ✓ 2 megabytes of fast RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard, mini tower, or mini desktop (shown) chassis with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Key Tronic 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$69.
- ✓ MS-DOS 5.0.
- ✓ FCC Class B approved.

386/SX16	40mb	80mb	100mb	200mb
Mono	\$999	\$1,129	\$1,199	\$1,449
Mono VGA	\$1,099	\$1,229	\$1,299	\$1,549
VGA Color	\$1,249	\$1,379	\$1,449	\$1,699
VGA 1024i	\$1,299	\$1,429	\$1,499	\$1,749

FAST MICRO
1-800-821-9000



FastMicro
3655 E. LaSalle St.
Phoenix, AZ 85040
(800)821-9000 (602)437-5700
(602)437-2300 FAX

CIRCLE 352 ON READER SERVICE CARD

© 1991 FastMicro, Inc. All trademarks acknowledged. Add 3% for shipping.

DISK DRIVES

CD-ROM	
Hitachi Ext. 680mb Kit.....	499
Sony Int. 680mb Kit.....	379
Book of Mammals / Encyclopedia.....	49/69
MS Bookshelf, Stat. Pack.....	
World Atlas & Consultant CDs.....	99
Colorado	
DJ-10 40-120mb Int. Tape.....	239
DJ-20 80-240mb Int. Tape.....	299
External Kit.....	69

Toshiba 100mb IDE Kit \$369

Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20ms 105mb drive and built-in 1:1 controller. 16 bit IDE card with dual floppy controller & cables, 5.25" brackets & rails.

Conner (see FastData IDE controllers)	
CP3044 40mb IDE 28ms.....	199
CP3104 100mb IDE 25ms.....	349
CP3208 200mb IDE 25ms.....	599

DTC	
6280 ESDI 16bit HD/FD Cont.....	119
6280-15T 15mb/sec transfer rate.....	169

Micropolis (see DTC Controllers)	
MC1864 345mb HH ESDI 14ms.....	1099
MC1568 668mb FH ESDI 14ms.....	1499
MC1518 1.3gb FH ESDI 14ms.....	2599

Plus Development	
HardCard IXL 50mb 9 ms 16bit.....	399
HardCard IXL 105mb 9 ms 16bit.....	579

Seagate 89mb AT Kit \$319

IDE performance, big 89 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

Seagate	
30MB XT Kit ST238 w/ cont.....	249
40MB AT ST251-1 MFM Drive.....	229
40MB AT ST157A 28ms IDE Drive.....	179
89MB ST1102A 19ms IDE Drive.....	299
125MB ST1144A 19ms IDE Drive.....	359
210MB ST1239A 15ms IDE Drive.....	599
330MB ST2383E 16ms ESDI Drive.....	1199

Tec	
1.2MB 5.25" Floppy.....	65
1.44MB 3.5" Floppy.....	65

Toshiba 1.44mb Floppy \$59

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add \$5.

Toshiba	
360K 5.25" Floppy (Black).....	59
1.2MB 5.25" Floppy.....	59
1.44MB 3.5" Floppy.....	59
100mb MK234FCH IDE 3.5" drive.....	349

Western Digital	
WD93044 40mb IDE 28ms.....	199
WDAC280 80mb IDE 20ms.....	299
WDAP4200 200mb IDE 20ms.....	649

MODEMS & FAX

ATI	
2400 ETC Internal / External.....	129/159
8514/Ultra+VGA 1mb.....	599
9600/E External MNP V 42bis.....	369



ATI \$369 9600ETC-E

ATI delivers speed and accuracy with the 9600 ETC-E. It includes V.42 LAPM, and MNP error correction combined with MNP5 and V.42 bis data compression to provide total high speed throughput. It features automatic line speed correction, synchronous/asynchronous communication and automatic feature negotiation with connecting with other modems.

Everex 2400B Int Modem.....	69
Hayes	
JT FAX 4800B Internal.....	139
Personal Modem 2400 w/Prodigy.....	119
Pocket Edition 2400 Modem.....	119

Intel	
Classic 2400 Modem Int/ Ext.....	139/169
Satisfaction Classic - Intl 9600.....	379



OmniLink Laser \$379

Don't settle for curled-up thermal paper or tie up your PC to receive faxes - get OmniLink Laser. It connects to your phone line and HP compatible laser and receives and prints your faxes. You can still print anytime you want and OmniLink will store up to 30 faxes while your printing. Plus, its a standard 2400/9600 modem/sendfax and software is only \$89.

Practical Peripherals	
2400B Int Modem.....	125
2400B Int with MNP.....	159
PM9600SA Ext. V.32/V 42bis.....	449

USRobotics	
2400 Sportster Int / Ext.....	119/135
2400 Sportster MNP Int / Ext.....	159/189
Courier HST 14,400 Int / Ext.....	539/579
Courier HST 14,400 Dual Std Ext.....	839

ZOOM	
HC2400 Internal.....	69
2400 V.42bis External Modem.....	159
9624 Send/Receive Int Fax Modem.....	119

MICE & INPUT

Key Tronic 101 Keyboard.....	59
Professional Mouse.....	59
Logitech	
Mouseman Serial nighthand.....	65
Mouseman Serial with Windows.....	127
Mouseman Bus nighthand.....	76
Mouseman Cordless.....	129
ScanMan 32.....	165
ScanMan 32 with Catchword.....	199
ScanMan 256 for Windows.....	279
Trackman Serial.....	75



Microsoft Mouse \$83

Ergonomic design and 400 DPI accuracy make this the world's most popular mouse. Microsoft design and mouse utilities assure compatibility with the programs you use most.

Microsoft	
Serial or Bus Mouse only.....	83
Serial or Bus with paint.....	95
Serial with Windows.....	147
Z-Nix Super Mouse II w/Windows.....	79



NETWORKING

Artisoft/Lantronic	
Lantronic Two Station Starter Kit.....	349
2 Mbps.....	499
Ethernet.....	499
Lantronic Additional Stations.....	139
2mbps.....	209
Ethernet.....	209

FASTDATA PRODUCTS



FastData 16 Bit VGA \$69 \$89

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.

FastData 16bit 1mb VGA.....	99
FastData CGA Card.....	35
FastData MGP Card.....	29

FastData Monitors



Your best value, guaranteed! We have a full line manufactured for us by manufacturers like Hyundai and Matsushita (Panasonic). As with all FastData branded products, you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.

VIDEO & MONITORS

ATI	
VGA Basic 16 / Integra.....	75 / 129
VGA Wonder + 256K / 512K.....	159 / 189
VGA Wonder XL 256K / 1mb.....	189 / 259
8514 Ultra 8514+VGA 1mb.....	599
Diamond	
SpeedStar 512K.....	179
SpeedStar Plus 1mb.....	259
Everex EGA 480 Card.....	69
FastData Monitors & Cards.....	see above
Hercules Graphic Card +	Call
Mitsubishi	
1410 EGA.....	325
Diamond Scan 1381.....	499
Diamond Scan 16L.....	919
NEC	
Multisync GS 2a.....	199
Multisync 3ds.....	589
Multisync 4ds.....	949
Orchid ProDesigner II 1mb.....	279
Paradise	
Basic VGA - 8 bit.....	99
VGA 1024 256K/512K.....	149 / 179
Panasonic C1381 VGA.....	369
Seiko	
CM1440.....	499
CM1450.....	639
Sony 1304 Multiscan.....	629
Video 7	
VGA 1024i 256K / 512K.....	129 / 149
V-RAM II VGA 512K / 1mb.....	249 / 319
Zenith 1492.....	599

BOARDS & CHIPS

Brown Wagh	
Sound Blaster.....	149
Sound Blaster Pro (stereo & MIDI).....	189
Everex	
RAM3000 16 bit - w/ OK (max 3mb).....	75
RAM3000 16 bit - w/ 1mb.....	135
RAM8000 16 bit - w/ OK (max 8 mb).....	169
RAM8000 16 bit - w/ 2mb.....	289
Intel	
287XL.....	85
387-DX25 or 33.....	209
387-SX16 / 20.....	129 / 139
Memory - 1mb SIMMS 80ns.....	559
Memory - 1mb chips 80ns set of 9.....	559

9600B SendFax w/ 2400B Modem.....	99
9600B Send/Receive Fax w/2400B.....	119
Ethernet 16bit 10Base-T.....	129
IDE 16 Bit 1:1 Hard/Floppy Disk Cont.....	29
IDE HD/FD w/Par2 Serial/Game.....	29
Parallel/2 Serial/Game Card.....	59
RL1 16bit 1:1 Hard/Floppy Disk Cont.....	59
XT 1.44 Dual Floppy Controller.....	35



FastData 2400 Baud Modem \$59

The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1 or 2. It has an internal speaker, is auto answer & auto dial, and comes with communications software.

FastData Monitors	
14" Amber or White Monochrome.....	99
14" White VGA Monochrome.....	119
14" CGA Color .52 dot pitch.....	199
14" VGA Color .31 dot pitch.....	279
14" Super VGA 1024 x 768i .28 dp.....	319
14" Non-Int VGA 1024 x 768 .28 dp.....	429



Sound Blaster \$149

Sound Blaster does for sound what VGA does for graphics! Supported by the largest software library, Sound Blaster make your games come to life. Also includes a music synthesizer, voice input and sound compression, and MIDI interface. SB Talker even converts text into spoken English! Includes a game port also!

PRINTERS

Canon	
BJ10E Portable.....	319
BJ300 / BJ330 Ink Jet.....	459 / 599
LBP-4 Laser.....	799
Citizen	
200GX 9 Pin.....	189
GSX-130 24 Pin.....	249
GSX140+ 24 Pin.....	295
GSX145 24 Pin Wide.....	395
PN48 Std / Pro.....	299 / 329
Fujitsu DL3400.....	359
NEC	
P3200 24 Pin.....	269
P3300 24 Pin Wide.....	369
P6200 / 6300.....	469 / 629
Silentwriter 2 Model 90.....	1550
Okidata	
Okilaser 400.....	669
Panasonic	
KXP1180 9 Pin.....	155
KXP1123 24 Pin.....	239
KXP1124i 24 Pin.....	289
KXP1624 24 Pin Wide.....	369
KXP2624 24 Pin Quiet.....	459
KXP4420 Laser.....	899
KXP4450i / 4455 Lasers.....	1299 / Call
Seiko Smart Label Printer Plus.....	167
Star	
NX1001.....	149
NX2410 / 2415.....	239 / 369
NX2410 / 2415.....	419 / 539

Texas Instruments

MicroLaser PS17 \$1199

PostScript laser printing has never been so affordable. The TIPS17 includes 1.5mb of memory, PostScript by Adobe, and 17 standard fonts including Times Helvetica, Courier and Symbol. It handles paper up to 8.5 x 14 and envelopes too!



Texas Instruments	
MicroLaser PS17.....	1199
MicroLaser PS35.....	1499



FastData 286/12 \$699

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Key Tronic keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleaved.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$59)
- ✓ Standard chassis (shown)
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports.
- ✓ Key Tronic enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ MS-DOS 5.0.
- ✓ Full documentation.
- ✓ FCC Class B approved.

	286/12	40mb	80mb	100mb	200mb
Mono	\$699	\$829	\$899	\$1,149	
Mono VGA	\$799	\$929	\$999	\$1,249	
VGA Color	\$949	\$1,079	\$1,149	\$1,399	
VGA 1024i	\$999	\$1,129	\$1,199	\$1,449	

DATABASE & FORMS

askSam 5.0	209
Clarion Personal Developer	45
Clarion Professional Developer	449
Clipper 5.01	489
DataEase	509
dBase III+	439
dBase IV	479
dBXL Diamond	129
Formbase	299
FormTool Gold	52
Formfiller	85
Foxbase Plus	179
FoxPro 2.0	449
Paradox 3.5	489
Paradox Competitive Upgrade	169
Paradox SE	65
PerForm Designer & Filler	89
Personal Rbase	79
Q & A 4.0	249
RapidFile	99
Rbase for DOS	447
Reflex	159

Personal R:Base \$79

Who says powerful relational databases are expensive? Not with Personal R:Base. It has intuitive pull-down menus that let you query your data, build quick forms and reports automatically and even build applications without complex programming. You can import from and export data to other formats and even dynamically reads and writes dBase files.

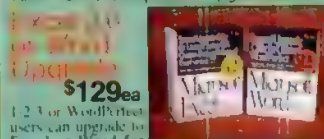


DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	299
Bannermania	21
db Publisher Professional	389
Express Publisher	Call
Pagemaker 4.0	489
PFS First Publisher	89
Printshop	33
Publisher's Paintbrush	279
Publish It!	129
Ventura Publisher Gold / Windows	519

WINDOWS SOFTWARE

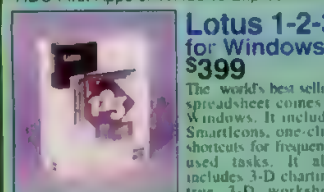
3-D Charts to Go for Windows	55
ACCPAC Simply Acctg for Windows	119
Adobe Illustrator	309
Adobe Streamline	119
Adobe Type Sets	Call
Adobe Type Align	59
Adobe Type Manager	59
Adobe Type Manager Plus Pack	115
After Dark for Windows	25
Ami	115
Ami Pro 2.0	287
Ami Pro 2.0 Competitive Upgrade	119



\$129ea

1-2-3 or WordPerfect users can upgrade to Excel or Word for Windows for just \$129. Excel is the top rated graphical spreadsheet with 3-D charting, linking, new ToolBar and more. Word for Windows just won PC World's best buy. To register your upgrade, you must have owned 1-2-3, WordPerfect or one of 11 other qualifying products.

Asymetrix Toolbook	279
BeckerTools Plus	Call
Bitstream Facelift	57
Corel Draw 2.0	359
Correct Grammar	57
Current	Call
DBFast/Windows	239
DynaComm 3.0 Async	139
Excel	299
FaceLift	57
Form Publisher	139
Grammatik IV for Windows	55
HDC First Apps or Windows Express	55



Lotus 1-2-3 for Windows \$399

The world's best selling spreadsheet comes to Windows. It includes SmartIcons, one-click shortcuts for frequently used tasks. It also includes 3-D charting, true 3-D worksheet organization, and the ability to link to external databases. Its advanced publishing features allow you to combine data, text and graphics on one page. You can upgrade to 1-2-3 for Windows from the spreadsheet you're now using for just \$99.

Instant Orgchart	119
JustWrite	129
Lotus 1-2-3 for Windows	Call
Lotus 1-2-3 Competitive Upgrade	119

FINANCIAL

ACCPAC BPI Value Pak	359
ACCPAC Simply Acctg for Windows	119
Bedford Integrated Acct	119
DAC Accounting 4.2	79
DAC Bonus Pack 4.2	119

Managing Your Money \$115

Andrew Tobias Managing Your Money is the one personal financial manager that does it all. It writes and prints checks, organizes and tracks income and expenses, manages payables and receivables, prints invoices, organizes and estimates taxes, analyzes debt, and needs, tracks and amortizes loans, manages your stock portfolio and more. Plus, it includes an electronic rolodex & appointment schedule and can export data to 1-2-3 and tax prep programs.



Dollars & Sense	55
Managing Your Money Money Matters	115
One Write Plus G/L, A/P & A/R	49
Pacioli 2000	165
Peachtree Crystal Acctg for Wind	35
Peachtree Complete III	139
Peachtree with Data Query	139
Quicken	209
The Manager's Organizer	36
Timeslips III	139
Wealth Builder	179
	89

ENTERTAINMENT

Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
Hunt for Red October	19
King's Quest 5 (VGA Vers.)	38
Leisure Suit Larry II or III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
PC Globe or PC USA	35
Simplicity	28
SimEarth	35
Win Commander I / II	39

Windows 3.0 \$89

Get in on the Windows revolution! Windows turns your 286 or above into a powerful multitasking workstation that runs even non-Windows applications. Includes many integrated applications standard. Plus, if you buy Windows from FastMicro, we'll throw in 12 of the best Windows shareware programs free!

Micrographix Draw +	149
Micrographix Designer	449
MicroPhone II	199
Microsoft Entertainment Pack	27
Microsoft Mouse w/ Windows 3.0	147
Microsoft Office Word/Excel/Powerpoint	447
Microsoft Powerpoint for Windows	309
Microsoft Productivity Pack	39
Microsoft Windows Developer's Kit	299
Microsoft Word for Windows	309
M.Y.O.B.	129
Norton Backup	85
Norton Desktop	95
ObjectVision for Windows	89
On Target	259



Visual Basic for Windows \$125

You've heard about it, now you can take advantage of this powerful and easy to use development system for Windows. Microsoft's Visual Basic contains a palette of visual tools to design and develop the Windows applications. It includes an interpreter to run your applications as you develop them and a compiler to turn them into royalty free EXE files. Also includes debugging tools and sample applications you can modify.

PackRat 3.0	239
Pagemaker 4.0	489
Persuasion	319
Per Form Pro	149
PFS WindowWorks	119
Pro Write Plus	165
Project for Windows	429
Publisher's Powerpak	45
Publisher's Paintbrush	279
RightWriter for Windows	Call
SuperBase 4	419
Turbo Pascal for Windows	Call
Ventura Publisher	519
WideAngle for Windows	62
Winconnect	59
Windows 3.0	89
WinFax Pro	69



We Ship Air at Ground Rates

GRAPHICS

Autosketch 3.0	139
Corel Draw 2.0	359
Design CADD 3-D	185
DrawPerfect	259
Freelance Graphics 4.0	299
Freelance Competitive Upgrade	89
Generic 3D Drafting	199
Generic Cadd Level 2 Starter Kit	89
Generic Cadd 5.0	279
Harvard Graphics	Call
PC Paintbrush IV Plus	109

PC Tools \$99 Deluxe 7.0

New PC Tools 7.0 is the perfect set of utilities for DOS 5. It includes new application menu systems, remote application control, another PC advanced data recovery and an enhanced Backup in DOS and Windows versions. Anti-Virus, which recognizes over 400 known viruses and even detects unknown ones is included as a free bonus.



INTEGRATED

First Choice	95
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89
Works w/ MS Serial Mouse	119

PROGRAMMING

Borland C++	299
Borland ObjectVision for Windows	89
Turbo Pascal Dos/Windows	90/Call
Macro Assembler	95
Microsoft C Compiler	303
Quick Basic	60
Quick C or Quick Pascal	60
Visual Basic for Windows	125
Windows Developer's Kit	309

SPREADSHEETS

Allways	115
Excel for Windows	299
Lotus 1-2-3 version 2.3	325
Lotus 1-2-3 version 3.1+	399
Lotus Upgrades	Call

Lotus 1-2-3 2.3 \$325

The powerful spreadsheet that runs on any PC. New WYSIWYG display mouse support, 200 graph types, drawing tools and other graphics features to make spreadsheet publishing a breeze. Release 2.3 also adds auto compress printing, auditor, file viewer, context sensitive help, print preview and more. Call us for upgrade information too!



Quattro Pro 3.0	309
Quattro Pro 3.0 Comp Upgrade	89
Quattro Pro 3.0 SE	47
Supercalc 5.1	89

WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	55
LetterPerfect	119
Multimate 4.0	267
Professional Write	159
Publisher's PowerPak / WordPerfect	Call

WordPerfect 5.1 \$239

WordPerfect is the #1 rated word processing software. Its got almost every feature imaginable and yet it's easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

Rightwriter	55
Sprint	117
Word	209
Word Perfect 5.1	239
Word Perfect for Windows	269
Word Perfect Add'l Station	89
Word Perfect Office	89
WordStar Professional	Call
Writer's Toolkit	79

UTILITIES

386 MAX	59
Address Book Plus	45
Calendar Creator Plus	39
Central Point Backup	79
CheckIt	79
Company Ladder	45
Control Room	69

MS-DOS 5.0 \$55

The new Microsoft DOS 5.0 frees 45K or more for DOS on 286 & 386 PCs. It includes a new Shell, Undelete and Unformat, new Editor and more. Also includes: Obsolete, Command

Line Help, new Backup and Windows enhance more. Plus, you can install it on your drive without reformatting, even on Networks. This official upgrade pack requires that you simply have an older command.com on your drive!

CoreFast	60
Carbon Copy Plus	105
Desqview 2.4	75
Desqview 386 2.4/6.0	125
Direct Access	57
Disk Manager Dos / Novell	36 / 95
Disk Optimizer	29
DR DOS 5.0	Call
GoScript 3.0	89
Fastback Plus	109
Headroom	59
HiJaak 2.0	95
InfoSpotter	45
Labels Unlimited	85
Laplink III	88
Mace Utilities 1990	88
Microsoft Learning DOS	32
MS-DOS 5.0 Upgrade	55
Norton AntiVirus	79
Norton Backup	90
Norton Commander	90
Norton Utilities 6.0	109

Stacker \$79

Stacker doubles the capacity of your hard disk in minutes, without reformatting. It compresses files in the background transparently giving you the extra room you need. For higher performance, Stacker software with coprocessor card (\$139) is an easily installable hardware solution which gives you hard disk a new lease on life.



PC Anywhere IV	95
PC Tools Deluxe 7.0	99
Personal Lawyer	34
P.D. Queue	55
PFS Preface	47
Pop Drop Plus	53
PrintRite	55
ProComm Plus	65
Prology	25
QA Plus	85
QEMM 386 6.0	59
QRAM 2.0	47
SideKick 2.0	55
Sideways	55
Smartcom Exec	69
Super PC Kwik	43
Virex-PC	75
XTree Gold 2.0	89

FAST MICRO



For Pricing on Other Products or to Order, Call Toll-Free (800) 441-3278



11 RM's. No Charge for Visa, MasterCard or Discover Card. All orders up to 20 pounds are shipped via Federal Express. Minimum order \$50. Shipping & handling charge, 3% (Min. \$6). Product warranties, offers & claims are handled by the manufacturer. FastMicro does not accept returns on software. No returns on software. All opened software must be returned to the manufacturer. No exceptions. DOA's repaired or replaced at our option. Call for return authorization (RA) before returning product. Shipping is not refundable. Sorry, no COD's. Personal/company checks delay shipping. AK HI & APO addresses add \$15 per box. Prices availability subject to change. Purchase orders accepted (no surcharges) from approved customers only. AZ orders add 6.7% tax. Address: FastMicro 6851 E. LaSalle St. Phoenix, AZ 85040. In-state orders call: 800-441-3278. Outside Arizona call: 602-437-5700. For more information call: 602-437-0300. FAX: 602-437-2300.



If You're Not Buying From Bulldog — You're Barking Up The Wrong Tree!

BULLDOG SYSTEMS

386-SX/20 w/80mbHD	\$1525
386-25 w/100mbHD	1895
386-33 CACHE w/100mbHD	1895

ABOVE SYSTEMS STANDARD CONFIGURATION
2MB RAM, 1.2 AND 1.44 FLOPPY, SUPERVGA CARD
W/1MB, 14" VGA COLOR MONITOR, DOS 5.0, WIN-
DOWS 3.0, DESKTOP CASE, 1 YEAR ON-SITE
WARRANTY

486-25 CACHE w/100mbHD	2239
486-33 CACHE w/100mbHD	2539

ABOVE SYSTEMS STANDARD CONFIGURATION
4MB RAM, 1.2 AND 1.44 FLOPPY, SUPERVGA CARD
W/1MB, 14" VGA COLOR MONITOR, DOS 5.0,
WINDOWS 3.0, TOWER CASE, 1 YEAR ON-SITE
WARRANTY
FOR OTHER CONFIGURATIONS, PLEASE CALL!!

FREE shipping on all BULLDOG systems prepaid with
a Cashiers check, Money Order or Bank Wire!

MAGNAVOX SYSTEMS

MAXSTATION 386-SX/20
2MB RAM, 80 MB HARD DRIVE, 1.44 & 1.2 FLOPPIES,
SUPERVGA BUILT-IN, MS-DOS 4.01, LOTUS WORKS
LOTUS MAGELLAN, NOVELL APPROVED.....\$1295

MAXSTATION 386-SX/20 CD
2MB RAM, 80 MB HARD DRIVE, 1.44 FLOPPY,
SUPERVGA BUILT-IN, MS-DOS 4.01, LOTUS WORKS
LOTUS MAGELLAN, NOVELL APPROVED, 680 MB
CD W/ GALILEO'S ENCYCLOPEDIA, MICROSOFT
BOOKSHELF, MICROSOFT SMALL BUSINESS CON-
SULTANT, PC GLOBE, PC USA, GEO JIGSAW AND
MICROSOFT STAT PACK.....\$1625

LAPTOPS & NOTEBOOKS

You can take these lightly!	
Magnavox Metals SX w/40 mb HD	1895
Panasonic CF270 W/20 W/50	1655/1899
Panasonic CF370 Notebook	2999
Leading Edge NB20mhz w/40 mb	2267
Leading Edge NB16mhz w/40 mb	2039
Leading Edge DLT386 Plus	1595
Atari Portfolio Palmtop	239
HP Palmtop	Call!!
POCKET PC	995

Call for Pricing on Toshiba Laptops!

MODEMS & FAX

ADTECH MICRO SYSTEMS	
Datafax 2400 Modem/9600 Fax	99
Externally Your Modem/Fax	138
Smart Connect 2400INT w/MNPS	85
Perfected Fax 96 Fax Card	89
Teleshare Fax/Modem Switch	99

CARDINAL	
2400INT/EXT	65/88
2400INT/EXT w/MNP	119/139
2400INT w/Sendfax	110
9600INT/EXT	299/325

COMPLETE	
Fax 9600/4800	279/145
Communicator	389
Answering Machine	239
Fax 9600 w/Page Scanner	699

EPSON	
Epson Priority Fax 3000	575

EVEREX	
1200 Int/2400 Int/2400 Ext	59/75/169
2400 Int/Ext w/MNP	149/139
2400 Int for PS/2	169
2496 Fax Modem Int/Ext	245/309

HAYES	
1200P w/Easy	45
2400 Int/Ext	169/329
9600 Int/Ext	525/659
JT Fax 4800 Int	119
JT Fax 4800 Portable	119

MEGAHERTZ	
Laptop Modems	125

PRACTICAL PERIPHERALS	
2400 Int/Ext	129/169
9600 SA Ext	475
2400 Pocket Modem	109

TOSHIBA FAX MACHINES	
3450/3750	659/729

US ROBOTICS	
9600 Courier HST Ext	569

PRINTERS

EPSON	
LX810	155
FX 650/FX1050	289/409
LQ200	229
LQ570/LQ870/LQ1170	259/439/589
LQ1010/LQ2550	359/649
EPL7000/EPL7500	789/1839

DICOMIX	
Dicomax 150+	109

SEIKO	
Smart Label	129

OKIDATA	
182 Turbo	229
320/321	319/439
380	235
380 Plus/381 Plus	339/599
383 Plus/383 Color Plus	919/1029

OKI LASER	
830	1399
840/820	1709/1279
800/400	959/629

NEC	
P3200/P3300	295/419
P9300	969
2000 XE	249
8200/6300	479/839
Silent Writer II-90	1659

PANASONIC	
1124/1180	275/159
1123/1654	219/539
1624/1695	349/369
2624	449
4420	799
4450/4455	1079/1999

HEWLETT-PACKARD	
Laser Series III/III	1599/2599
Laser III/III	899/1069
Desk Jet 500	525

LASER ACCESSORIES	
Pacific Data 1mb/2mb	99/139
Pacific Data 25-N-1	249
Pacific Bar Code/Pacific Outlines	315/187
Pacific Page PE/Pacific Page XL	329/699
Pacific Type/Pacific Print	259/219

Plotter in a Cartridge	
Headlines in a Cartridge	229
Pacific Connect 25K	249
Complete Font Library	249
Super Set Plus 425	265
HP Toner III/III	69/79

CANON	
LBP-11BP/III	819/1499
BJ10EX	329

MEMORY BOARDS

AST	
Six Pack w/384K XT	129
Six Pack 286 w/OK AT	95
Rampage 256 w/OK AT	319

INTEL	
Above Board w/512K XT/AT	265
Above Board II w/OK PS/2	219
Above Board w/2MB AT	429

ORCHID	
Ramquest 16/32 w/OK PS/2	199
Ramquest 16/16 w/OK XT/AT	129

EMULATION BOARDS	
AST 5251-11 Enhanced Plus	489
DCA Irma Board III	405
DCA E78+ Software	239

ACCELERATOR BOARDS	
Orchid Tiny Turbo 286	205
Orchid Tiny Turbo Extra	249
Orchid Tiny Turbo AT	359
Intel Inboard 386PC w/1mb	499

DISK COMPRESSOR	
Infochip Expand Plus	139
386 Electronic Stacker	145
LOGICAL CONNECTION W/512K	349

MATH CO-PRO

INTEL	
8087-3	79 387-25 199
8087-2	129 387-33 199
387-16	199 387-SX16/20 125/135
387-20	199 287-XL/XT 89

CYRIX	
387-16/20	169/179 387-33 189
287XL	85 387-SX16/20 109/125
387-25	179 487-20 209

1MB SIMM 80ns		55
256K SIMM 80ns		19
SIMM DRAM, SIPP		Call

ULSI	
387SX-16/20/25	109/119/139
387-16	175 387-33 175

HARD & FLOPPY DRIVES

CONNER	
40 IDE 3.5"/104 IDE 3.5	229/419
20 IDE 3.5"	549

OMEGA	
Bernoulli 20 MB Int/Ext	825/1095
Bernoulli Dual 20 MB Ext	1925
Bernoulli 44 MB Int/Ext	819/919
Bernoulli Dual 44 MB Ext	1725
PC25 Bootable Controller	189

MAGNAVOX	
481RS EXT CD ROM w/Software	399

MAXTOR	
40 MB AT IDE/80 MB IDE	229/319
XT 4380E 300 MB ESQI	1149
4230E 200 MBESQI	825

PACIFIC RIM	
Ext Drive 380K for PS/2	179
Ext Drive 1.2 MB for PS/2	199
Ext Drives for most Laptops	209

PLUS DEVELOPMENT	
Hard Card 20/40 for XT	489/549
Hard Card II 80 for AT	489
Hard Card XL 50/105 for AT	389/575

WESTERN DIGITAL	
40 MB IDE	189

SEAGATE	
ST125/ST1238 Kt XT	219/229
ST125-1/ST 4096 AT MFM	239/425
ST280A/ST1239AA IDE	259/735
ST157A/ST1102A/ST1144A	169/299/399

TOSHIBA	
380K/1.2MB/1.44MB	59/69/69

VIDEO CARDS

ATI	
VGA Wonder Plus 256K/512K	189/209
Ultra 615/512K/1MB	399/529
Ultra 615+ VGA 512K/1MB	469/599

BOCA	
Basic VGA	69
Super VGA W/512K	135

CARDINAL	
VGA 118	59
VGA 700/732 w/1MB	139/169

HERCULES	
Graphics Station 1024+	949

NEC	
Graphics Engine w/1MB	889

ORIGID	
Prodesigner/E	189
Prodesigner IIS 512K	189

PARADISE	
VGA Plus 8/18	135/169
1024/256K/512K	149/197
85+K	429

VIDEO SEVEN	
Vega VGA	119
1024/256K/512K	119/149
VRAM 1512K/1MB	229/299

TAPE DRIVES

ARCHIVE	
40 Meg Int/Ext	239/349
60 Meg Cont Int/Ext	579

COLORADO MEMORY SYSTEMS	
DJ10 120 Meg Int Jumbo	249
DJ20 250 Meg Int Jumbo	299
QFA 700 NEW 700 Meg Int	705
Dual Floppy Cable CK-17	25
External Kt KE-10	115

EVEREX	
60F Int	239
60 Meg Teac w/Card INT/EXT	575/689

MOUNTAIN	
300mb dual ext w/QIC02	2395
525Q Portable SCSI	1495
Maynardream 80 int w/cont	589
Maynardream 150 int w/cont	769

SCANNERS & DIGITIZERS

Logitech Scan Man/Scan Man 256		149 289
Summa Scan 12X12/12X18		339/549
Marstek 800 w/Printbrush and OCR		155
Marstek 800 for Windows w/Perceive		155
Marstek Color Artist		189
Epson ES 300C Color Scanner		1450
MSC Color Hand Scanner		535
DEST Personal Scanner		899
Complete Fax 9600 w/Page Scanner		699
Complete 1/2 Page Scanner		179
Complete Full Page Scanner		509
Complete Hand Scanner		155
Complete Communicator		299

SOFTWARE

Aldus Pagemaker	489
Ad Pro Upgrade	109
Carbon Copy	110
Clarion ProDeveloper	449
Clipper 5.0	499
Corel Draw	365
Database IV	479
Designview 386	129
Enable O/A	415
Finewise V3.1	110
Fontbase	195
Foxpro/Foxpro Distribution Kit	449/299
Freelance Plus	309
Framework III	455
Harvard Graphics	309
IBM DisplayWrite V	229
Lotus 2 01/2 3/3 1	309/345/399
Lotus Symphony	479
Manager's Organizer	149
Microsoft Windows 3.0	109
Microsoft Word	219
Microsoft Word for Windows	319
Microsoft Excel for Windows	319
Ultimate 4.0	249
Norton Utilities 6.0/Norton Antivirus	109/85
PC Anywhere IV	75
PC Tools 7.0	299
Peachtree III Complete	131
Peachtree Double Bonus	219
Paradox V3.5	469
Procomm Plus	64
Q&A 4.0	249
Quattro Pro	299
Rbase V3.1	485
Super Calc V	299
Ventura Desktop Publishing	519
Word Perfect 5.1	239
Wordstar 5.5/6.0	169
Wordstar 2000	229

Lots of other software available and all the prices are here star!

NETWORK

Call for the best pricing on your networking needs!

3COM	
3C503 Etherlink II	195
3C503 Five pack	769
3C503T 10 Base T	259
3C505 Etherlink Plus	299
3C507 Etherlink 16	279
3C523 MCA Ethernet	269

ARTISOFT	
Starter Kit 10MBPS/2MBPS	469/339
Lan Cards 10 MBPS/2MBPS	189/145
PS/2 Lan Cards 10MBPS/2MBPS	269/205

HAYES	
Lan Step Base System (5 User)	349
Lan 5 User Expander	229

NOVELL	
Network 2.2 5/10 User	849/1419
Network 3.11 20/100 User	2459/4839
Ethernet Net1000/NE2000	135/159

SMC	
PC130/PC130E	99/129
PC500WS/PC500FS	189/289
HUB 6-Active/4-Passive	269/689

THOMAS & HONRAO	
TC8142/TC8142-TP	85/99
TC8245/TC8245-TP	205/219
TC6045/TC6045-TP	189/219

WESTERN DIGITAL	
Ethercard 8 bit/16 bit	149/169
Tecan Card 8 bit/16 bit	349/399
10 Base T Card 8 bit/16 bit	185/205

OTHER NETWORK PRODUCTS CALL!

MICE & MISC.

TC8245/TC6245-TP+	205/218
TC6045/TC8045-TP+	189/218
WESTERN DIGITAL	



JDR Microdevices

2233 Samaritan Drive, San Jose, CA 95124

Serving you since 1979

BUY WITH CONFIDENCE FROM JDR!

- 30-DAY MONEY BACK GUARANTEE
- 1 YEAR WARRANTY
- TOLL-FREE TECH SUPPORT

MMC
MEMBER

MOTHERBOARDS

NEW
LOWER
PRICES



16MHz MINI 386-SX \$299.95

• NORTON SI 15.3 • LANDMARK AT SPEED 20.8

- EXPANDABLE TO 8MB ON BOARD • AMI BIOS • CHOOSE 0 OR 1 WAIT STATE FOR USE WITH SLOWER RAM • FIVE 16-BIT AND THREE 8-BIT SLOTS • CHIPS & TECHNOLOGY NEAT™ CHIPSET • SOCKET FOR 80387-SX CO-PROCESSOR • 8.5" X 13" SIZE FITS MINI-286 & FULL-SIZE 286 CASES

MCT-386SX		\$299.95
MCT-386SX-20	20MHz MINI 386-SX	\$349.95
MCT-M386-25	25MHz MINI 386	\$499.95
MCT-C386-33	MINI-SIZE 33MHz CACHE 386	\$699.00
MCT-C386-40	MINI-SIZE 40MHz CACHE 386	\$899.00
MCT-M486-33	MINI 33MHz CACHE 486	\$1295.00
MCT-M286-16	MINI 16MHz 286	\$199.95
MCT-M286-12	MINI 12MHz 286	\$179.95
MCT-TURBO-10	MINI 10MHz 8088	\$69.95

INTERFACE CARDS

16-BIT IDE MULTI I/O \$69.95

- 286/386 486 COMPATIBLE
- SUPPORTS 2 IDE HARD DRIVES & 2 FLOPPIES (800K 720K 1.2MB & 1.44MB)
- TWO SERIAL, ONE PARALLEL & ONE GAME PORT
- SUPPORTS COM1 THRU 4 LPT1 2 & 3
- ALL FUNCTIONS CAN BE INDIVIDUALLY DISABLED

MCT-IDEIO		\$69.95
MCT-FDC-HD	1 44MB FLOPPY(2X) CARD	\$49.95
MCT-FDC-HD4	4 FLOPPY VERSION	\$59.95
MCT-HDC	HARD DISK CARD	\$79.95
MCT-RLL	RLL HARD DISK CARD	\$89.95
MCT-FAFH	16-BIT 1 1 MFM F/H CARD	\$149.95
MCT-AFH-RLL	16-BIT 1 1 RLL F/H CARD	\$199.95
MCT-ESDI	16-BIT 1 1 ESDI CARD	\$149.95
MCT-IDEFH	IDE FLOPPY/HARD CARD	\$29.95
MCT-HIO	MULTI I/O CARD FOR 8088 SYSTEMS	\$69.95
MCT-AIO	286/386 486 MULTI I/O CARD	\$49.95
MCT-AEMS	16-BIT EMS CARD	\$129.95
MCT-EEMS	16-BIT EEMS CARD	\$149.95
MCT-VGA	8/16-BIT VGA CARD	\$149.95
MCT-VGA-1024	1024 X 768 VGA	\$169.95
MCT-VGA-1024+	1024 X 768/256 COLORS	\$199.95

UPRIGHT CASE

\$249.95

- FOR STANDARD FULL SIZE AND MINI MOTHERBOARDS
- 250 WATT POWER SUPPLY (110/220V)
- MOUNTS FOR 3 FLOPPY AND 4 HARD DRIVES
- TURBO AND RESET SWITCHES
- SPEED DISPLAY POWER DISK LEDS
- MOUNTING HARDWARE: FACEPLATES AND SPEAKER INCL

CASE-100 \$249.95

MORE CASES...

CASE-200	UPRIGHT HOLDS 11 DRIVES	\$499.95
CASE-120	MINI-UPRIGHT W/200 WATT PS	\$199.95
CASE-70	FULL-SIZE 286 STYLE CASE	\$89.95
CASE-50	MINI-SIZE 286 STYLE CASE	\$59.95

POWER SUPPLIES

PS-135	8088 135 WATT	\$59.95
PS-150	8088 150 WATT	\$69.95
PS-200X	8088 200 WATT	\$89.95
PS-200	286/386 486 200 WATT	\$89.95
PS-250	286/386 486 250 WATT	\$129.95

1024 x 768 \$499.95 VGA PACKAGE

- 8088 & 286/386 486 COMPATIBLE CARD & 1024 X 768 INTERLACED MONITOR
- 11 ASPECT RATIO 0.28 DOT PITCH
- 256 COLORS FROM 262 000
- 8-16-BIT CARD HAS 512K VIDEO RAM EXPANDABLE TO 1MB

VGA-PKG-1024+		\$499.95
VGA-PKG	640 X 480 VGA PACKAGE	\$399.95

MORE MONITORS...

NEC-MULTI-3DS	LOW EMISSION MONITOR	\$649.00
VGA-MON-1024	28mm 1024 X 768 MONITOR	\$349.95
VGA-MON-1024N	AS ABOVE NON-INTERLACED	\$479.95

2400 BAUD MODEM \$79.95

- 2400-1200/300 BPS INTERNAL DATA MODEM • FULL HAYES AT COMPATIBILITY • INCLUDES PROCOMM SOFTWARE

MCT-24I		\$79.95
MCT-FAXM	AS ABOVE W/4800 BPS FAX SEND	\$89.95
PCEM7296	INTEL 9600 BPS EXTERNAL	\$549.00
PCCB6201	INTEL SATISFACTION FAX/MODEM	\$449.95
VIVA-24MNP	2400 BPS EXT MODEM W/MNP	\$149.95

CALL FOR OUR FREE CATALOG TODAY!

FOR PC'S, MONITORS, DISK DRIVES, KEYBOARDS, MODEMS, LAPTOPS, CABLES, CONNECTORS, SOFTWARE, PROGRAMMING PRODUCTS, TEST EQUIPMENT, ICS & MORE!



DISPLAY CARD \$49.95 DIAGNOSES SYSTEM ERRORS

PLUG INTO SLOT READ DISPLAY AND CHECK MANUAL FOR POWER-ON SELF-TEST CODE

- 286/386 486 COMPATIBLE
- WORKS WHEN SOFTWARE WON'T EVEN BOOT PC
- PLACE DISPLAYS ON-BOARD OR ON BACK PANEL

PCODE		\$49.95
PCODE+	WITH QA PLUS VERSION 3.12	\$69.95

UNIVERSAL PROGRAMMER/TESTER

- PROGRAMS EPROMS, EEPROMS
- PALs: BI-POLAR PROMS 8748 & 8751
- SERIES 16V8 & 20V8 GALs • TESTS TTL CMOS DYNAMIC & STATIC RAMS
- LOAD DISK SAVE DISK, EDIT, BLANKCHECK PROGRAM, AUTO READ MASTER, VERIFY & COMPARE • ACCEPTS 3" TO 6" WIDE IC'S (8-40 PINS)
- MOD-MUP REQUIRES HOST ADAPTOR CARD \$499.95

EPROM PROGRAMMING MODULES

- PROGRAMS 24-32 PIN EPROMS, CMOS EPROMS & EEPROMS 16K TO 1024K • HEX TO OBJ CONVERTER
- AUTO BLANK CHECK/PROGRAM/VERIFY
- MOD-MEP \$119.95
- MOD-MEP-4 4-EPROM UNIT \$169.95
- MOD-MAC COMMON HOST ADAPTOR CARD \$29.95

BREADBOARD ON-A-CARD

- INCLUDES ADDRESS DECODING LOGIC, DATA BUFFERING 2 LSI CIRCUITS FOR PROGRAMMABLE DIGITAL I/O & COUNTER/TIMING FUNCTIONS • ACCEPTS UP TO 24 14-PIN IC'S • ACCEPTS 9.15, 25 OR 37-PIN D-SUBS
- PDS-601 8-BIT CARD \$79.95
- PDS-611 16-BIT CARD WITH I/O DECODE \$89.95

PROTOTYPE CARDS

- JDR'S CARDS INCLUDE FR-4 EPOXY LAMINATE WITH GOLD-PLATED EDGE CARD FINGERS & SILK-SCREENED LEGENDS
- JDR-PR2 8-BIT WITH I/O DECODE LAYOUT \$29.95
- JDR-PR10 16-BIT WITH I/O DECODE LAYOUT \$34.95

3-BUTTON MOUSE \$14.95

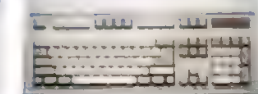
- SELECTABLE ACCURACY 290 - 1450 DPI
- SWITCH SELECTABLE MICROSOFT OR MOUSE SYSTEMS COMPATIBILITY MODE
- OPTO-MECHANICAL DESIGN
- WINDOWS 3.0 COMPATIBLE
- JDR-MOUSE-3 \$14.95

HARD DRIVES 45MB \$219

5-1/4"	ST-251-1	42 8 MB	MFM	28MS	\$249
3-1/2"	ST-157A	44 7 MB	IDE	28MS	\$219
5-1/4"	ST-277-1	65 5 MB	RLL	28MS	\$289
3-1/2"	ST-1102A	89 1 MB	IDE	19MS	\$399
3-1/2"	ST-1144A	131 MB	IDE	19MS	\$499
3-1/2"	ST-1201A	177 MB	IDE	15MS	\$749
5-1/4"	ST-2383A	338 MB	IDE	16MS	\$1295
5-1/4"	1664	161 MB	ESDI	16MS	\$899
5-1/4"	1664	345 MB	ESDI	14MS	\$1449
5-1/4"FH	1568	676 MB	ESDI	16MS	\$2195

FLOPPY DRIVES

FDD-1.44X	1 44MB 3 5" FLOPPY - BLACK	\$79.95
FDD-1.44A	1 44MB 3 5" FLOPPY - BEIGE	\$79.95
FD-55GFV	5 25" TEAC DOUBLE-SIDED HD 1 2MB	\$99.95
FDD-1.2	5 25" DOUBLE-SIDED HD 1 2MB	\$89.95
FD-55B	5 25" TEAC DOUBLE-SIDED DD 360K	\$89.95
FDD-360	5 25" DOUBLE-SIDED DD 360K	\$69.95



101-KEY
\$49.95

101-KEY WITH 12 FUNCTION KEYS • 286/386 486 COMPATIBLE	
BTC-5339	 \$49.95
FC-3001	101-KEY, 12 F-KEYS & CALCULATOR \$69.95
BTC-5060	84-KEY WITH 10 FUNCTION KEYS \$59.95

DYNAMIC RAM

PART #	SIZE	SPEED	PINS	PRICE
TMS4464-12	65536x4	120ns	18	3.49
41256-100	262144x1	100ns	16	1.99
41256-80	262144x1	80ns	16	2.19
414256-100	262144x4	100ns	20	6.95
414256-80	262144x4	80ns	20	7.95
1MB-100	1048576x1	100ns	18	6.95
1MB-80	1048576x1	80ns	18	7.95
1MB-60	1048576x1	60ns	18	9.95

SIMMS

PART #	SIZE	SPEED	FOR	PRICE
41256A98-80	256K x 9	80ns	SIMM/PC	21.95
421000A88-10	1MB x 8	100ns	SIMM/MAC	64.95
421000A98-10	1MB x 9	100ns	SIMM/PC	64.95
421000A98-60	1MB x 9	60ns	SIMM/PC	69.95
421000A98-80	1MB x 9	80ns	SIMM/PC	69.95

MATH CO-PROCESSORS

MANUAL, SOFTWARE GUIDE & 5 YEAR WARRANTY

NEW
LOWER
PRICES

	PART #	SPEED	PRICE	PART #	SPEED	PRICE
INTEL	8087	5 MHz	89.95	80387-20	20 MHz	209.95
	8087-2	8 MHz	129.95	80387-25	25 MHz	219.95
	8087-1	10 MHz	169.95	80387-33	33 MHz	229.95
	80287-XL	12 MHz	94.95	80387-SX	16 MHz	129.95
CYRIX	80387-16	16 MHz	199.95	80387-SX20	20 MHz	149.95
	80387-20	20 MHz	209.95			
IT	80387-25	25 MHz	219.95	83S87-16(SX)	16 MHz	129.95
	80387-33	33 MHz	229.95	83S87-20(SX)	20 MHz	149.95
				83S87-25(SX)	25 MHz	159.95
MATH	2C87-8	8 MHz	79.95	2C87-12	12 MHz	99.95
	2C87-10	10 MHz	89.95	2C87-20	20 MHz	139.95

MAXIMIZE CO-PROCESSOR SPEED

OUR "2ND STAGE" ALLOWS 20MHZ CO-PROCESSORS TO RUN AT FULL SPEED IN THE SLOWEST 286 SYSTEMS

2ND-STAGE FOR 10/20 MHz 80287S \$49.95
OTHER VERSIONS FOR 8, 12 OR 16 MHz 80287S

SALES 800-538-5000

Customer Service 800-538-5001 Local/Toll 408-559-1200
Technical Support 800-538-5002 Fax 408-559-0250

Save BIG on Computer Products



DRIVES AND BACKUPS

Conner Hard Drives	
3000 42MB 3.5" IDE 28ms	\$189
3100 104MB 3.5" SCSI 25ms	\$379
3104 104MB 3.5" IDE 25ms	\$379
3204 209MB 3.5" IDE 19ms	\$599
Seagate Hard Drives	
SEAST157A 40MB IDE K1	\$199
SEAST280A 70MB IDE	\$229
ST225 KIT 20MB w/Cont. XT	\$229
ST238 RLL 30MB RLL XT w/Cont.	\$239
ST251-1 40MB 28 MS 1/2 HT	\$249
ST4096 80MB 28 MS	\$489
Microplus	
1355 159MB ESDI FH 28MS	\$469
1558 338MB ESDI FH 18MS	\$1199
1568 676MB ESDI FH 16MS	\$1299
Plus Development Hard Drive Cards	
40MB Hard Card	\$29.99
80MB Hard Card II	\$499
Hard Card IXL 50MB / 105MB	\$379/\$589

Panasonic

Optical Drives	
Worm External 5.25" 940MB Drive	\$299
Worm Internal 5.25" 940MB Drive	\$299
Overwrite External 5.25" 1GB Drive	\$799
Overwrite Internal 5.25" 1GB Drive	\$899

Mountain Internal Tape Backups	
40/120MB XT or AT	\$249
80/300MB AT	\$499

Archive Tape Back-up	
40MB Internal XT or AT	\$249
80MB Internal AT	\$359

Toshiba	
CD ROM 600MB AT External	\$899
CD ROM 600MB PS/2 MCA	\$899

FLOPPY DRIVES	
Toshiba Disk Drive Kits	
ND 04D 1/2 HT 360K (PC/XT)	\$59
ND 08DE 1.2MB (PC/AT)	75
ND 356T 3.5" 1.44MB AT K1	75

Sony Disk Drives	
3.5" 720K (PC/XT/AT)	59
3.5" 1.44MB Slimline	59
3.5" 1.44MB	59

MONITORS	
Panasonic 14" Color	
C1381 SVGA 1024 x 768 (.28mm)	\$349
C1395 SVGA 1024 x 768 non-interlaced (.28mm)	\$499

Packard Bell 14" Color	
8551VG VGA 640 x 480 (.51mm)	\$199
8539VG VGA 640 x 480 (.39mm)	\$249
8528SV SVGA 1024 x 768 (.28mm)	\$349

NEC Multisync Color	
2A 800 x 600 14"	\$419
3DS 1024 x 768 14"	\$599
4DS 1024 x 768 16"	\$999
5D 1280 x 1024 20"	\$2275

Sony 14" Color	
1304HG 1024 x 768 Multisync	\$599
1320 640 x 480 VGA	\$449

ADC	
MM413 14" VGA Mono	\$129

INPUT DEVICES	
Etronics Watto-Shoot Joystick	
Logitech Mouseman Serial	\$10.99
Right Handed	\$2.99
Logitech Trackman Serial	\$79.99

Microsoft	
Ballpoint Mouse for Laptops	\$119.99
Bus or Serial w/Paintbrush	\$99.99
Microsoft Mouse Serial/Bus	\$79.99

Mouse System	
White Mouse Bus/Ser.	\$9.99/\$19.99
Omnimouse II w/Paint Bus/Ser.	\$49.99/\$89.99
PC Trackball Bus/Ser.	\$59.99/\$44.99
Summa Sketch 12 x 12	\$339.99

SCANNERS	
Logitech Scanman 256	\$279.99
MouseSystems HandScan w/OCR	\$149.99
Panasonic Flatbed I/J, and III	CALL
Epson Desktop Color Scanner	\$1099.00



Monitor not included

PACKARD BELL COMPUTERS

THESE PACKARD BELL SYSTEMS INCLUDE:
• 2 Floppy Drives • Enhanced 101 Keyboard • Mouse
• Tutorial • DOS 5.0 • QBasic • PB Desktop • Lotusworks

1 YEAR ON-SITE WARRANTY

PACKARD BELL

America's grow-up listening to us. It still does.

Not affiliated with any former Bell System entity

	FORCE SX	FORCE SX16+	FORCE 820+	FORCE 820H+
Processor	80386SX-16	80386SX-20		
Hard Drive	44MB	85MB	105MB	130MB
Stand. RAM	2MB (5MB)	2MB (16MB)	4MB (16MB)	
Expansion Slots	3 16-BIT	4 16-BIT		
Video Support	800 X 600 (256K) Memory	1024 X 768 (512K) Memory		
I/O Ports	1S, 1P, 1M, 1G, 1VGA	2S, 1P, 1M, 1VGA		
ELEK-TEK				
Price	\$1099	\$1299	\$1499	\$1799

2400B Internal Modem with SX16+, 820+, & 820H+ Faxboard with send/receive with 820H+

PACKARD BELL NOTEBOOK COMPUTERS

286NB	386SXNB-2M
• 80C286/12MHz • 3.5" 1.44MB FDD	• 80C386SX/16MHz • 3.5" 1.44MB FDD
• 20MB Hard Drive • 640 x 480 VGA	• 40MB Hard Drive • 640 x 480 VGA
• 1MB RAM exp. to 8MB	• 2MB RAM exp. to 5MB
• 1 year depot warranty	• 2400B Int. Modem w/send/fax
	\$1399

MATH COPROCESSORS

Intel Math Coprocessors	
8087 (5MHz)	\$85
80872 (6/8 MHz)	119
80871 (10MHz)	159
80287XL (6.8, 10MHz)	
and 80C287 (12MHz)	79.99
80287XLT Compaq LTE/286, and Tandy 2800	79.99
80387SX (16MHz)	119.99
80387SX (20MHz)	129.99
80387 (16, 20, 25, 33MHz)	99.00
80487SX (20 MHz)	459.00
Cyrix Math Coprocessors	
82587 (8-20MHz 80286)	79
83D87-16 (16MHz 80386)	179
83D87-20 (20MHz 80386)	179
83D87-25 (25MHz 80386)	179
83D87-33 (33MHz 80386)	189
83S87-16 (16MHz 80386SX)	109
83S87-20 (20MHz 80386SX)	119

CHIPS AND SIMMS	
256K (all speeds)	CALL
1MB (all speeds)	CALL
Simms Modules (all speeds)	CALL
Sipps (All Speeds)	CALL

ACCELERATOR/UPGRADE BOARDS	
Sola	
286 Accelerator	\$199
386SX Accelerator	359
Express 386SX 16MHz Upgrade	359
Express 386SX 20MHz Upgrade	469
I/O - II Drive Controller	89

ETRONICS MODEMS	
2400 Baud Internal w/software	\$59
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

DISKETTES	
3 1/2" D500	6.50
3 1/2" D510	12.99
3 1/4" D500	3.99
5 1/4" D500 (IBM AT)	7.50

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.50
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

3 1/2" D500	7.99
3 1/2" D510	14.99
3 1/4" D500	5.99
5 1/4" D500 (IBM AT)	9.99

MEMORY UPGRADES FOR IBM

Legend IBM™ Compatible PS/2	
Memory Upgrades	
529795 512K 30-286	\$49
529802 2MB 30-286	125
529810 1MB 70-E61, 70-121	79
529828 2MB 70-E61, 70-121	129
529836 2MB 70-A21	129
529844 1MB 80-041	99
529852 2MB 80-111, 80-311	159

Legend Memory available for Toshiba	
Laptops, AST, HP, Mac & Others. CALL	

BOARDS	
Intel Aboveboard	
Above Board Plus w/512K	\$289
Above Board Plus w/2MB	399

AST Boards	
SixPak Plus w/384K	225
SixPak 286 w/512K	175

Boca Boards	
Boca I/O 2 Ser., 1 Par:	49
Boca AT Plus 12K	109
Boca AT Plus 2MB	225
Boca VGA Basic	69
Infoclip	
Expanz Data Compression Board	99

NETWORKING PRODUCTS	
NE1000 Anthem 8-bit Ethernet	\$134.99
NE2000 Anthem 16-bit Ethernet	189.99
3COM 3C503 Etherlink II PC/XT/AT	99.99
SMC Arcnet PC-130 8-bit board	99.00
SMC Arcnet PC-130E 8-bit board	119.99
Lantronic 10MBPS Starter Kit	499.00
Lantronic 10MBPS Ethernet Adapter	229.00

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	
2400 Baud Internal w/V.42 & software	115
2400 Baud External no software	89
2400 Baud External w/V.42 no software	139

2400 Baud Internal w/software	\$59
2400 Baud External w/software	\$69

SPEED. GUARANTEED.



Here's a chance to buy our \$79.95 Math Coprocessor at no risk whatsoever! It's fully guaranteed to at least double the math performance of your software.

If you want to unlock the full power of your PC, pick up the phone and order an AMD 80C287 math coprocessor. Without it, your PC just isn't really complete. You see, our math coprocessor can *dramatically* increase the performance of 1-2-3,[®] dBASE,[®] Excel, and hundreds of your other favorite business applications! It actually runs calculations *two to ten times faster* than your PC can *without* a math coprocessor. Which means your graphs will draw incredibly fast and your spreadsheets will recalculate at truly blazing speeds. (And that's just for starters!)

High speed at a low price.

Don't think you have to pay over \$200 for a math coprocessor. Now you can get ours for just \$79.95 when you order direct from AMD! The AMD 80C287 is fully compatible with your 80286-based PC and the hundreds of commercially available software packages written for it. Our coprocessor is also compatible with the Intel NMOS 80287.

Installation is a snap.

The AMD 80C287 plugs easily into a socket that's already inside your 80286-based PC. In fact, you can be up and running in just five minutes. Simply plug the chip into the socket and watch the dazzling improvement in performance! The AMD 80C287 comes with easy-to-follow installation instructions, a free utilities disk (which includes diagnostics and test software), and free color computer games.

Advanced Micro Devices, Inc. 

9020-11 Capital of Texas Hwy N., Suite 400
Austin, TX 78759-9797

Volume or dealer inquiries welcome. 1-2-3 is a registered trademark of Lotus Development Corporation. dBASE is a trademark of Ashton-Tate Corporation. Intel is a registered trademark of Intel Corporation.
CIRCLE 197 ON READER SERVICE CARD

Our Triple Guarantee

Guarantee #1: If the AMD 80C287™ doesn't do everything we promise, or if you are unsatisfied for any reason, return the product within 30 days of purchase and AMD will happily refund your money.

Guarantee #2: If your AMD 80C287 Math Coprocessor ever fails to perform for any reason, AMD will replace it free of charge, no questions asked. Limited to two lifetime replacements per person.

Guarantee #3: AMD guarantees that the AMD 80C287 is fully compatible with your 80286-based hardware and software. If you have any compatibility problems with the AMD 80C287 during the first year, return the product and we will gladly refund the purchase price.

To Order Call Now

1-800-888-5590 ext. 2400

Outside of USA call (512) 345-1728



Yes. I want to double or triple the calculation speed of software running on my 286-based PC. Send me an AMD 80C287 Math Coprocessor, risk free, for only \$79.95 plus tax, shipping and handling. I understand that I can return the AMD 80C287 for a full refund within the first 30 days if I am not completely satisfied.

NAME _____

ADDRESS _____

CITY/STATE/ZIP _____

Visa/MC# _____

Type of PC _____



INTERNATIONAL ORDERS WELCOME

"YOUR SOFTWARE SPECIALISTS"

TO ORDER CALL TOLL FREE

1-800-822-8088

★ CALL FOR OUR FREE CATALOG ★

"GIVE US THE OPPORTUNITY TO BEAT ANY ADVERTISED PRICE"

SOFTWARE ADD-ONS

ACCOUNTING

Accpac Bedford Accounting
Accpac BPI/GA A/R, A/P, U/C
Accpac Easy G/L, Payroll ea
Accpac Plus G/L, A/R, A/P, Payroll ea
Accpac Plus U/C, O/E, R/I, J/C ea
Accpac Plus Windowing Mgr
Businessworks Bundle
DAC Easy Accounting/Payroll 4.1
DAC Easy Bonus Pak 4.1
DAC Easy Network
MicroBiz Retail Store Controller
One Write Plus Accounting System
Pacioli 2000
Peachtree Complete III Accounting
Peachtree w/Data Query III
Profitwise Power Pak
Profitwise Acctg (10-Pak)
Timeslips III

C.A.D.

Autocad 10
Autocad v. 11
Autosketch 3.0
DesignCAD 3D
Design CAD 5.0
Drafts CAD Ultra
Generic 3D Drafting
Generic CADD 5.0
Generic CADD Starter Kit
Mathcad 2.5
Mathcad Advanced Math Pak
Turbo CAD

COMMUNICATIONS

Brooklyn Bridge 3.0
Carbon Copy Plus
Close-Up Customer
Close-Up Support
CoSession 2-user
Crosstalk For Windows
Crosstalk Mark IV
Lap Link III
Mirror III
PC Anywhere III
PC Anywhere IV
PC Anywhere IV LAN
Procom Plus
Smartterm 240
Smartterm 320
Smartterm 400

DATABASE

Advanced Revelation
Alpha IV
AskSam
Clipper 5.01
Database
Data Flex (Multiuser)
Dataperfect
dBase III Plus
dBase IV 1.1
dBase IV Developer's Kit 1.1
dBase IV LAN
dBaseXL Diamond
Foxbase Plus 2.1 LAN
Foxbase Plus 2.1 S/U runtime
Foxbase 2.1 Single User
Foxbase Plus 386
Foxbase Plus LAN Runtime
Fox Pro 2.0
Fox Pro LAN 2.0
Fox Pro Distribution Kit
Informix 4GL Compiled
Informix 4GL Compiled Runtime
Informix SQL
Informix SQL Runtime
Oracle Professional
Paradox 3.5
PC File 6.0
PC File LAN
PC Focus
PFS Professional File
Q & A 4.0
Quicksilver Diamond
R&R Code Generator
R&R Reportwriter (dBase)
RBase for DOS 3.1
Reflex 2.0
UI Programmer 2.1

DESKTOP PUBLISHING

Adobe Illustrator Windows
Express Publisher
First Publisher 3.0
Freedom of the Press
Newsmaster II
Newsroom Pro
Pagemaker 4.0
Publish-It
Publishers Paintbrush
Publishers Power Publisher Word
Publisher's Type Foundry
Ventura Gold For DOS

FINANCE

Managing Your Money
Market Analyzer Plus
Money Counts
Money Matters
Quicken 4.0
Turbo Tax Pro Series

GRAPHICS

Applause II
Graphics Link Plus
Harvard Graphics 3.0
Micrografix Charisma
Statgraphics 4.0
Systat w/Sygraph 5.0

INTEGRATED

First Choice
Geoworks Ensemble
Lotus Symphony 2.2
Lotus Works
Microsoft Works
Smartware II

MICE & SCANNERS

IMSI Mouse
Kensington Expert Mouse PC
Kraft Trackball
Logitech Mouse Man-Bus
Logitech Mouse Man-Serial
Logitech Mouse w/Paintshow
Logitech Mouse (Serial) Windows 3.0
Logitech Scanman 256
Logitech Trackman
Microsoft Mouse
Microsoft Mouse w/Paintbrush
Microsoft Mouse w/Windows 3.0
MS Mouse (5 Pak)
PC Mouse III
PC Trackball (serial)

NETWORKING

Desklink 2.2
Lantastic Ethernet Starter
Lantastic Starter Kit
Microsoft LAN Mgr Server
Microsoft SQL Server
Novell Netware 2.2 5 user
Novell Netware 2.2 10 user
Novell Netware 2.2 50 user
Novell Netware 3.11 20 user
Novell Netware 3.11 100 user
Novell Netware 3.11 250 user

PAINTING

Animator
Artline
Arts & Letters Graphics Editor
Calendar Creator plus
Corel Draw
Deluxe Paint II Enhanced
Designer 3.0
Dr. Halo III
Draw Perfect
Flowcharting III
Formfiller
Formtool Gold
Formworks whil n' file
GEM/3 Draw Plus
Grap
Gray Fix
IBM Storyboard Live
Lotus Freelance Graphics
Org Plus Advanced
PC Globe
PC Paintbrush IV Plus
PC USA
Per Form
Pizzaz Plus
Printmaster Plus
Printshop
Softtype
Xerox Formbase

PROGRAMMING

API Plus/PC
Borland C++
Briol Editor
Briol dBase
Claron Professional Developer 2.0
Claron Professional Developer 2.1
k-Edit
Microsoft Basic PDS 7.1
Microsoft C Compiler 6.0
Microsoft Cobol Compiler
Microsoft Fortran 5.0
Microsoft Macro Assembler 6.0
Matrix Layout
Microsoft Quick C
Microsoft Quick Pascal
Microsoft Quickbasic 4.5
MS Quick C/Assembler
MS Windows Development Kit 3.0
PowerBasic
RM Cobol 85
Smalltalk V For Windows
SPF/PC
Turbo Debugger
Turbo C++
Turbo C Tools
Turbo Pascal 6.0
Turbo Pascal Pro

PROJECT MANAGEMENT

Harvard Project Manager 3.0
Project Scheduler V
Superproject 2.0
Timeline 4.0
Timeline 4.0 LAN Pak

SPREADSHEETS

Lotus 1:2:3:3
Lotus 1:2:3:3 Server
Lotus 1:2:3:3 I
Lotus 1:2:3:3 I Server
LUCID 3D

Microsoft Excel
Microsoft Multiplan
Quattro
Quattro Pro 3.0
Quattro Pro LAN Pak
Supercalc V

UTILITIES

386-to-the-Max 5.1
Above Disc Plus
Acl I
Allways 1.2
Ami Diag
Automenu
Battery Watch Pro
Catchword
Check It
Control Room
Copy II PC
Copy II PC Deluxe Option Board
Corporate Ladder
Cruise Control
Dan Bricklins Demo II
Dan Bricklins Page Garden
Desquere
Desquere 386
Direct Access 5.0
Direct Access Network
Disk Manager
Disk Optimizer
Disk Technician Advanced
Diskette Manager III
D R DOS 5.0
FAST
Fastback Plus
Fastlynx
Fastpak Mail
Fastrix
Finger Simulator 4.0
Geoworks Ensemble
Go Script 3.0
Go Script Plus 3.0
Goler
HDC Windows Express
Headroom
Hi Jaak
Hyperpad
Impress
InfoSelect
Instant Recall
Ko Pilot for WP
Label Pro
Labels Unlimited
Le Menu Plus
Lotus Agenda
Lotus Magellan 2.0
Mace 1990
Mace Vaccine
Mavis Beacon Teaches Typing
Memory Mate
Menuworks
Microsoft DOS 3.3 w/GWBasic
Microsoft DOS 4.01 w/GWBasic
Microsoft DOS 5.0 Upgrade
Microsoft DOS 5.0 w/GWBasic
Microsoft Learning DOS
Microsoft Windows 3.0
Netroom
Netroom (4 user)
Netroom (10 user)
Norton Utilities 6.0
Norton Anti Virus
Norton Backup
Norton Commander 3.0
Norton Editor
Optune
OS/2 Extended
OS/2 Standard
Pathfinder 4.11
Pathfinder Plus
PC Tools Deluxe 7.0
PC MOS 386
PC MOS 386 (5-user)
Pop-Drop Plus
Power Panel
Print-O 5.0
Print O LAN
Prokey Plus
QA Plus
QDOS III
QEMM
QRAM
Reading Kit For Windows
Sidekick 2.0
Sideways 3.3
Software Bridge
Software Carousel
Spinrite II
Switch-It

Turbo EMS
Typing Tutor V
Ultrascrpt PC
Ultrascrpt PC Plus
VGA Dimmer
Willmaker
Wonder Plus
Word for Word Professional
Xtree Gold

WINDOWS

AccPac Simply Accounting
Actor
Adobe Illustrator Windows
Adobe Type Manager
Adobe Type Mgr. Plus Pak
After Dark For Windows
Becker Tools For Windows
Corel Draw
Crosstalk For Windows
Crystal Accounting
Designer 3.0
Desktop Set
Drafix CAD For Windows
DynaComm
Facilit
Form Publisher
HIC First Apps
HIC Icon Designer
HDC Windows Express
Lotus 1:2:3 For Windows
Mathcad For Windows
Microsoft Office For Windows
MS Excel 3.0
MS Project For Windows
MS Windows 3.0
MS Windows Development Kit 3.0
New Wave
Norton Desktop For Windows
Objectvision For Windows
OmniPage Professional
Packrat 3.0
Pagemaker 4.0
Perform Pro
Powerpoint For Windows 3.0
Pro Write Plus For Windows
Publishers Power Pak for Windows
Soft Type
SQL Windows
Superbase IV Windows
Sybex Windows Accounting
Taxis
Toolbook
Turbo Pascal For Windows
Ventura Gold For Windows
Winconnect
WinFax
Win 2
Wordscan
Wordscan Plus

WORDPROCESSING

Ami Professional
Grammatik For Windows
Grammatik IV
Grammatik IV LAN (5u)
IBM Displaywrite V
Letterperfect
Microsoft Word 5.5
Microsoft Word For Windows
Multimark 4.0
Personal Law Firm
PFS Professional Write
Rightwriter 4.0
Wordperfect 5.1
Wordperfect 5.1 (5-Pak)
Wordperfect 5.1 (20-Pak)
Wordperfect Office PC
Wordperfect Office PC (1.5u)
Wordperfect Office PC (1.20u)
Wordstar 6.0
Write III
Zyindex Index 3.1
Zyindex Professional 3.0

XENIX / UNIX

Informix 4GL-Xenix 386
Informix 4GL-Xenix 386 Runtime
Lotus 1:2:3 for Unix V
MS Word 5.0 for Xenix
RM Cobol 85 for Unix 386
SCO Foxbase + 386 Run-Xenix
SCO Foxbase + 386-Xenix
SCO Lynx 386-Xenix
SCO Manager 386-Xenix
SCO Multiview 386-Xenix
SCO Professional 386-Xenix
SCO Unix 386 Development System
SCO Unix 386 Operating System
SCO VPIIX (3+ user)
SCO Xenix 386/AT Operating System
Wordperfect for SCO Xenix
Wordperfect for SCO Xenix (1-10u)
Wordperfect for SCO Xenix (1-5u)

TO ORDER BY FAX:

215-639-7234

For Products not Listed call:

215-639-7110

Please send all correspondence to:

Software Add-Ons
Two Greenwood Square
3331 Street Rd., Suite #155
Bensalem, PA 19020

Prices, terms, and availability subject to change without notice

Policies:

- 1 - We accept VISA, Mastercard & Discover - No Surcharge
- 2 - Shipping - any item - \$6
- any 2 items - \$7
- 3 or more add 1%
- 3 - COD Charge of \$5 per order
- 4 - Purchase Orders must be approved. International Orders welcome (except Canada).
- 5 - DEALERS & VAR INQUIRIES WELCOME.
- 7 - Returns are subject to approval - 10% restocking fee.

OUR POLICY
90 DAY MONEY
BACK GUARANTEE
13 DAY 4 SAT

PC Magazine says "...Arlington offers worry-free mail order purchasing at reasonable rates!"

HEWLETT-PACKARD

Laserjet III w/Toner	\$1549
Laserjet IIP w/Toner	\$869
Laserjet IIIP w/Toner	\$1059
1MG Upgrade	\$99
2MG Upgrade	\$139
4MG Upgrade	\$229
Deskjet 500	\$489
Pacific Page/XL	\$329/\$699
Pacific CFL	\$259
Pacific Data 25 in 1 Font	\$249

EPSON PRINTERS

LX810	\$155	LQ570	\$259	LQ2550	\$849
FX850	\$289	LQ860	\$549	EPL7000	\$789
FX1050	\$395	LQ870	\$435	EPL7500	\$1959
LQ200	\$229	LQ1070	\$359	DFX5000	\$1269
LQ510	\$245	LQ1170	\$569	DFX8000	\$2139

OKIDATA PRINTERS

ML320	\$319	ML390	\$439	OLC 400	\$639
ML321	\$439	ML391	\$599	OLC 800	\$939
ML380	\$219	ML393	\$919	OLC 820	\$1249

PANASONIC

1123	\$199	1695	\$369
11241	\$275	2624	\$439
1180	\$149	4420	\$789
1624	\$339	44501	\$1079
1654	\$539	4455	\$1749
4420/44501	2MG Memory		\$159

CITIZEN

GSX140	\$279	GSX200	\$159
GSX145	\$399	HSP500	\$299

ARLINGTON COMPUTERS

386 SX-20, 1.2 Floppy, 1MG, 40 MG,
VGA (1024 x 768) Color Monitor,
DOS **\$1299**

386-25, 2MG, 1.2 Floppy, 40 MG,
VGA (1024 x 768) Color Monitor,
DOS **\$1499**

386-33W/64K Cache, 4MG, 89 MG,
VGA (1024 x 768) Color Monitor,
DOS **\$1849**

Includes One Year On-Site Service and 30 Day Money-Back Guarantee!

NOTEBOOKS

AST 43V, 386, 40 MG	\$2699
Epson NB3S, 40 MG	\$2999
Panasonic CF170, 10 MHz, 20MB	CALL
Panasonic CF270, 16 MHz, 20MG, VGA	\$1559
Panasonic CF370H6 386SX-20, 60MG, VGA	\$2799

GOLDSTAR

286, 12 MHz, 1 MG Memory, 40MG, VGA Monitor	\$949
386SX, 16 MHz, 1MG, 40MG, VGA Monitor	\$1099
386SX, 20 MHz, 1MG, 40MG, VGA Monitor	\$1249
386 Tower, 33 MHz, 4 MG Memory	\$1599
Laptop - 386SX, 40 MG, VGA	\$1649

SOFTWARE

D Base IV	\$479
Harvard Graphics 3.0	\$389
Lotus 123 2.2/3.1	\$329/\$389
Microsoft Mouse	\$89
Microsoft Excel	\$299
Microsoft Windows 3.0	\$79
Microsoft DOS 5.0	\$79
Multimate Version IV	\$239
R Base for DOS	\$439
Symphony	\$459
Ventura Desktop Publ.	\$519
Word Perfect 5.1	\$249

COMPAQ

Model 386S w/40 MB	\$1899
Model 386E w/40 MB	\$2499
Model 386E w/100 MB	\$2699
LTE 20	\$1699
LTE 286 20/40	\$2099/\$2399
LTE 386-60MB	\$3999
6 Month Warranty	

MULTIFUNCTION BOARDS

AST 6 Pack w/384K	\$159
AST Rampage Plus	\$329
Irma Board III	\$399
AST 5251-II Plus	\$449



Intel Above Board+	\$269
Intel Plus 8 w/2 MG	\$399
Intel 386 PC w/1 MG	\$459
Intel Satisfaxion	\$359
Intel Scanner Option	\$299
Intel Snap-In 386	\$359

DRIVES & TAPES

Ext. 5 1/4" for PSII	\$159
Ext. 1.2 for PSII	\$159
Toshiba 3 1/2" 720K	\$69
Toshiba 3 1/2" 1.44	\$69
Colorado Jumbo 120	\$249
Everex 60 MB Tape	\$209

SEAGATE HARD DISKS

48 MB 3 1/2" (157N-Kit)	\$259
40 MB (157A)	\$179
40 MB for AT (ST251-1)	\$229
80 MB for AT (4096)	\$399
80 MG 296 Kit	\$299
89 MG 1102A	\$279
106 MG 3120A	\$369
120 MG 1144A	\$439
211 MG 1239	\$599

IOmega

90 MB Int. w/boot card	\$979
90 MB Ext. w/boot card	\$999

PLUS

Hard Card 40 MB	\$549
Hard Card 50 XL	\$369
Hard Card 80 MB	\$489
Hard Card 105 MB	\$559

CONNOR HARD DRIVES

40 MB	\$199
100 MB	\$349
200MB	\$589

MODEMS

Hayes 1200/2400 Ext	\$279/329
Hayes Pocket 2400	\$119
V-Series 9600 Int.	\$489
Hayes Ultra 96	\$609
Intel 2400	\$139
Intel 2400 Ext.	\$159
Intel 2400 Ext. MNP	\$209
Intel 9600 Ext.	\$479
Mghtz 2400 Tosh/CPQ	\$129
Everex 2400	\$79
Everex 2400 External	\$169
US Robotics 9600	\$569
US Robotics Dual Std	\$799

CHIPS

256K/1 MG Chips, each	\$4/\$7
256K/1MB Simms	\$20/\$59
Compaq 386 4 MB	\$299
Compaq SLT 2 MB	\$239
Compaq LTE 2MB	\$179
Compaq LTE 386 4MB	\$499
Compaq Port 2MB	\$275
IBM 2-8 MG Board	\$349
IBM 70 & 80 2 MB	\$129
IIT 2C87-12	\$79
IIT 3C87-20/25	\$149
OKI Lazer 2MB	\$149



Intel 8087-2	\$109
80287-10XL/XLT	\$89
80387-16/80387-SX	\$195/\$129
80387 SX-20	\$139
80387-20	\$195
80387-25/80387-33	\$195/\$195
80487 SX	\$449

SCAN. & DIGIT.

Epson ES300C	\$999
Logitech ScanMan	\$159
Panasonic FXRS 3070U	\$939
Summasketch 12x12	\$319
Summasketch 12x18	\$559

NETWORKING

Netware 2.2 5 User	\$499
Netware 2.2 10 User	\$1099
Netware 2.2 50 User	\$1949
Lantastic 10BPS Starter	\$469
E143 Ethernet	\$209
NE1000 Ethernet	\$139
NE2000	\$159
Ethercard +/-16	\$139/\$169
EtherLink II 3 Com	\$189

VIDEO BOARDS

ATI 16 Basic	\$89
ATI VGA Wonder	\$179
ATI VGA Wonder 512	\$199
ATI 8514 1MG	\$489
Epson VGA 16 Bit	\$79
Genoa 6300/6400	\$169/\$219
Hercules Station	\$649
NEC Grph Engine 256	\$849
Orchid Pro II	\$269
Paradise VGA 1024	\$139
Paradise +16	\$129
STB Power IMG	\$199

MONITORS

MITSUBISHI

EGA	\$319
VGA XC1429	\$389
Diamond Scan	\$489
HL6615 16"	\$1029
HL6935 20"	\$1789

NEC

Multisync IIA	\$409
Multisync IIID	\$549
Multisync IVD	\$979
Multisync VD	\$2099

PANASONIC

1381 VGA 1024x768	\$329
1395 VGA 1024x768	\$539

GOLDSTAR

Color/EGA	\$199/\$259
VGA 1425+/1430	\$259/\$279
VGA 1460	\$319

**Arlington
Computer
Products, inc.**

Prices and availability subject to change without notice. *Includes CPU, only in most U.S. locations. Money-back guarantee does not include shipping charges.

HOURS C.A.T.
7:30 - 6:30 pm - Mon.-Fri.
10:00 - 1:00 pm - Saturday

1970 CARBOY
MT. PROSPECT, IL 60056

VGA MONITOR & SYSTEMS DIGITAL



800-548-5105

CUSTOMER SERVICE AND IN ILLINOIS 708-228-6333

SHIPPING 708-228-9748

TECHNICAL ASSISTANCE 708-228-1470

We Export! FAX 708-228-0516

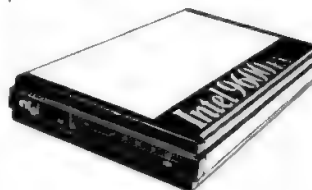
No surcharge for MasterCard or Visa.

intel Math Co-Processors



8087-3	\$89
8087-2	\$109
80287-10XL	\$89
80287XLT	\$89
80387-16	\$195
80387-SX	\$129
80387-SX20	\$139
80387-20	\$195
80387-25	\$195
80387-33	\$195
80487-SX	\$449

Intel's 9600EX Modem



Intel 2400	\$139
Intel 2400 Ext	\$159
Intel 2400 EXT Mnp ..	\$209
Intel 9600 External ..	\$479

Arlington Computer Products is an authorized intel dealer. Please call for immediate delivery at very competitive prices.

Intel® Above™ Board Plus 8 w/2MB \$399



Intel® 386PC w/1MB \$459

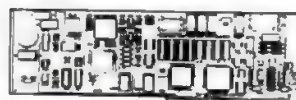


NEW! Snap In 386 for IBM 6 & 8 Mhz AT, PS/2 50 & 60.

Snap In 386 makes IBM 286 systems fly. It features:

- 386 SX-20 module which plugs into 286 socket.
- 16k cache which gives 1.7-2x performance boost
- works with any 287 math coprocessor
- All for only \$359

Intel SatisFAXtion™ Board \$359



FOR ORDERS:

**800
548
5105**

TERMS AVAILABLE TO APPROVED CUSTOMERS

Panasonic Office Automation

COMPLETE LINE OF PANASONIC PRODUCTS AT EXTREMELY COMPETITIVE PRICES



Complete line of Panasonic Printers:

	CPS	Draft	Carriage	Print Head
1123	192	Narrow	24	
1124I	240	Narrow	24	
1180	192	Narrow	9	
1624	192	Wide	24	
1654	300	Wide	24	
1695	330	Wide	9	
2624	240	Wide	24	
4420 ...	8 pg/min.		300 DPI	
4450I .	11 pg/min.		300 DPI	
4455 .	11 pg/min.		300 DPI	



CF170

- CMOS V20 CPU running at 20MHz
- 640K RAM Standard
- RAM Expandable to 1.6Mb.
- Built-in 20Mb. Hard Disk
- Built-in 3.5" 1.44Mb. floppy disk drive
- CGA Compatible Fluorescent Super Twist LCD Display
- Rechargeable NiCad Battery Pack Lasts up to 4 hours
- Weight 6.1 lbs. (including battery pack)
- MS-DOS 3.3 Included

CF270

- 80C286 CPU running at 16/8 MHz
- 1Mb. RAM Standard
- RAM Expandable to 5Mb.
- Built-in 20Mb. Hard Disk
- Built-in 3.5" 1.44Mb. floppy disk drive
- VGA Compatible Backlit Fluorescent Triple SuperTwist LCD Display
- Resume Function
- Rechargeable NiCad Battery Pack Lasts up to 3 hours
- Weight 6.9 lbs. (including battery pack)
- MS-DOS 4.01 Included

CIRCLE 336 ON READER SERVICE CARD



C1381 14" ANALOG MULTI-FREQUENCY COLOR MONITOR

- 14" diagonal high contrast black matrix CRT for crisp, clear graphics & brilliant colors.
- Compatible with MCGA, VGA, SVGA, 8514/A & Macintosh II color board
- 1,024 x 768 maximum resolution interlaced or 800 x 600 maximum resolution non-interlaced.

VERY COMPETITIVE PRICES!

NO EXTRA CHARGE FOR MASTERCARD OR VISA

Arlington Computer Products

1970 CARBOY MT. PROSPECT, IL 60056

HOURS C.S.T.
7:30 am-6:30 pm — Mon.-Fri.
9 am-2:00 pm — Sat.

LAPTOP COMPUTERS

AST Premium Exec 286 20/40MB	CALL
AST Premium Exec 386 20/40/60MB	CALL
Compaq LTE386 30MB	3599
Compaq LTE386 60MB	3895
Compaq SLT386 60MB	CALL
Everex Tempo LX 20/40/60MB	CALL
NEC Ultralite 286F	CALL
Packard Bell PB286N VGA/20MB	1369
Packard Bell PB386SX VGA/40MB	CALL
Panasonic CF270/370	1579/2949
Sharp PC6220 286 VGA 20MB	SPECIAL
Texas Instrument TM2000	CALL
Texas Instrument TM3000	CALL
Toshiba T1200XE	1599
Toshiba T2000SX 20MB	2729
Toshiba T3200SX	3199
Toshiba T3200SYC 120MB color	5799
Toshiba T5200 100MB	4199
Zenith ALL MODELS	CALL

COMPUTERS

AST Premium II 386SX 20 model 5	1899
AST Premium II 386/33 model 5	2399
AST Premium II 486SX 20 model 5	2499
Compaq Deskpro 386S w/80MB	2149
Compaq Deskpro 386S/20 w/80MB	2299
Compaq Deskpro 386/20E w/124MB	2799
Compaq Deskpro 486/33L mod 320	9229
Compaq SystemPro	ALL MODELS
DTK 286/386 486	custom quotes CALL
Packard Bell all models	CALL
Wyse Terminals 30.50/50	294/375/298

DISK DRIVES

Conner CP3044 40MB IDE	229
Conner CP3104 105MB IDE	389
Maxtor LXT213A 213MB IDE	799
Microplus 1654-7 161MB ESDI	789
Plus Hardcard II XL 50MB	379
Plus Hardcard II XL 105MB	585
Seagate ST251-1 40MB MFM	242
Seagate ST157A 45MB IDE	177
Seagate ST1102A 89MB IDE	287
Seagate ST1144A 124MB IDE	379
Seagate ST1239A 211MB IDE	595
Teac 380K 5 25" floppy	59
Toshiba 1 2MB 5 25" floppy	69
Toshiba 1 44MB 3 5" floppy	69

MATH CO-PROCESSORS

Cyrix 80387DX 20	189
Cyrix 80387DX 25	189
Cyrix 80387DX 33	199
Intel 80387XL	89
Intel 80387SX-16	129
Intel 80387SX-20	139
Intel 80387SX-20/25/33	199
Witek ALL MODELS	CALL

MEMORY PRODUCTS

2MB for T1000SX/E & T2000SX	269
2MB for T1200XE	179
1MB for AST Exec	149
2MB for T.I. TM3000	249
1MB for CPQ LTE 386SX	319
256x4 80ns DRAM	5.50
256x9 80ns SIMM	17.00
1MBx9 80ns SIMM	CALL
4MBx9 80ns SIMM	CALL



**MIDWEST
COMPUTER
WORKS**

QUALITY SERVICE & GUARANTEED LOWEST PRICES!

PRINTERS

PANASONIC

KXP1180	149
KXP1123	199
KXP1124	275
KXP1624	349
KXP1654	535
KXP2624	429
KXP4420 Laser	SUPER
KXP4450 Laser	LOW
KXP4455 Laser	PRICES

OKIDATA

182 Turbo	225
320	314
321	439
390	439
391	599
393+ Color	999
Laser 400	627
Laser 600	925
Laser 840	1629

HEWLETT PACKARD

Deskjet 500	499
Laserjet IIP	849
Laserjet IIP	1049
Laserjet III	1549
Laserjet IIP	2499
Laserjet IIP	3740
Paintjet	769
Paintjet XL	CALL
Scanjet	699
Plotter all models	CALL

DICONIX by Kodak

150+	329
150+ carrying case	29
Color4 inkjet	989

CANON

BJ10E Bubblejet	317
BJ10E carrying case	29
BJ300	459
BJ330	599

STAR

NX1001	149
NX1020R Color	214
NX2420R Color	339
NX2420 Color	509
NX2420 Color	639
LaserPrinter 4	859

QUME

Crystal Express	CALL
-----------------	------

SEIKOSHA

SP 2000+	165
LT-20	299
SL-90	319

CITIZEN

GSX 140+/145	299/399
--------------	---------

QMS

410 Postscript	1749
810 Postscript	2749
815 Postscript	3629
825 Postscript	4359
Colorsprint 100	6479

TEXAS INSTRUMENTS

MicroLaser Basic	899
MicroLaser Basic XL	2149
MicroLaser PS17	1199
MicroLaser PS35	1499
MicroLaser XL PS17	2489
MicroLaser XL PS35	2799

EPSON

FX-850	CALL
LO-570	CALL
LO-870	CALL
EPL 7000	CALL
DFX 5000	1389
DFX 8000	2229

SEIKO

Smart Label Printer	174
---------------------	-----

LASERJET ACC.

Adobe Postscript cart HP II	309
HP Paper Cassette trays	IN-STOCK
Pacific Data 25 in 1 cart	257
Pacific Data Postscript cart HP II/III	339
Pacific Data memory boards	CALL

BATTERY BACKUPS

American Power AP400 slimline	299
American Power AP500	259
American Power AP600	445
American Power AP900	607
Tripp Lite BC450	259
Tripp Lite BC750	465
Tripp Lite ISO Bars	ALL MODELS

MICE

Logitech Dexa 2-button serial	49
Logitech C9 serial 1/PS/2	79
Logitech Mouseman	79
Logitech Cordless Radio Mouse	135
Microsoft bus or serial 400 dpi	89
Microsoft Ball Point mouse	125
Microsoft mouse w/windows 3.0	149

CD-ROM DRIVES

NEC CD-ROM	ALL MODELS
Toshiba CD-ROM	ALL MODELS
Sony CD-ROM	ALL MODELS

SOFTWARE

Adobe Type Manager	59
Adobe Type Manager Plus	119
Adobe Illustrator	305
Adobe Streamline	119
Advanced Revelation	699
Aldus Pagemaker 4.0	489
Asymetrix Toolbook	279
AMI AMI Pro	119/289
Beatstream Facilit	59
Blitstream Facilit Value Pk	119
Borland Quattro Pro	304
Caere Omnipage	449
Caere WordScan Plus	549
Corel Draw 2.0	359
Lotus 1-2-3 ver 3.1	399
Microsoft Excel 3.0	299
Microsoft Office for Windows	489
Microsoft Powerpoint	299
Microsoft Windows 3.0	299
Microsoft Word for Windows	299
Polaris Packet 3	255
Precision SuperBase4	409
Word Perfect 5.1	249
Xerox Ventura Gold 3.0	519
Xerox Formbase	293

OVER 1000 TITLES IN STOCK!

PLOTTERS & DIGITIZERS

Calcomp 12x12 digitizer	299
Calcomp 12x18 digitizer	599
Hewlett Packard plotters	CALL
Kurta 12x12 IS/one	359
Kurta 12x17 IS/one	598
Summagraphics summa II 12x12	CALL
Summagraphics summa II 12x18	CALL

TAPE BACKUP

Colorado DJ-10-40-120MB int tape	239
Colorado DJ-20-120-250MB int tape	299
Inwin tape drives	ALL MODELS
Maynard XL5540 40MB	249
Maynard VP150i	869
Maynard 2500 internal	1129
Mountain 40MB int/ext	249/CALL
Mountain FS8000 int	519

MODEMS

Cardinal 2400 baud int MNP-5	99
Calpak 2496 send/rec fax/modem	139
Intel Satisfaction Board	IN-STOCK
Megahertz modems for all laptops	CALL
Practical Peripherals PM2400 int	139
US Robotics Courier 2400 MNP/5	279
Worldport Fax/Modems for laptops	CALL
Zoom modems	CALL

MONITORS

Goldstar ALL MODELS	CALL
Mitsubishi ALL MODELS	CALL
NEC 14" 14" monitor VGA	179
NEC 14" 14" VGA 800x600	429
NEC 3DS 14" multisync 1024x768	569
NEC 4DS 16" multisync 1024x768	CALL
NEC 5D 20" multisync 1280x1024	2199
Packard Bell 8551 14" VGA 51mm	219
Packard Bell 8509 14" VGA 28mm	282
Packard Bell 8528SV 14" 1024x768	329
Panasonic 1381 14" 1024x768	339
Panasonic Ultra-1200/Ultra-1400	CALL
Samsung ML 4571 14" mono VGA	139
Samsung CT4581 14" 800x600 VGA	439
Samsung Syncra 17" 1024x768	CALL
Sony 1440/1450 14" VGA 25mm	495/635
Sony CPD1304 14" 1024x768 25mm	579
Zenith 1482 14" flat lens VGA	592

VIDEO BOARDS

ATI VGA Wonder XL w/mouse 256K	165
ATI VGA Wonder XL w/mouse 512K	197
ATI VGA Wonder XL w/mouse 1MB	249
ATI 8514 Ultra 512K 1MB	395/485
ATI Graphics Ultra w/mouse	CALL
Cardinal-700 1024x768 512K/1MB	138/159
Hercules Graphics Station 1M/3M	529/679
NEC Graphics Engine	599/849
Orchid Pro Design IIS 512K/1MB	197/262
Paradise VGA+ VGA-16	SPECIAL
Paradise 8514/A	469
Video 7 1024x 256K/512K	179/209

MISC

Ad Lib music card	119
Soundblaster	159
Keyboards XT/AT	69

SCANNERS

Complete PC 1/2 page scanner	185
Complete PC page scanner & Wordscan	559
Hewlett Packard Scanjet	699
Logitech Scanman 256	299
Microtek Scanmaker 600Z	1029
Microtek Scanmaker 600G	1329

NETWORKING

3COM 3C503 Etherlink	CALL
Digiboard	ALL MODELS
Lantronic Ethernet Starter Kit	469
Nehware 2.2.5 user	482
Nehware 2.2.5 user	1945
Nehware 3.11 20 user	1899
Nehware 3.11 100 user	3799
Nehware 3.11 250 user	8999
NE1000/NE2000 Boards	145/173
SMC Arcnet PC130	98
SMC Arcnet PC500WS	179
SMC Arcnet PC500FS	289
Tera	ALL MODELS
Thomas Conrad	ALL MODELS
Western Digital Elite	145

FAX MACHINES

Canon Faxphone 24	769
Panasonic Panafax UF127	599
Panasonic UF300 plain paper	1499
Panasonic UF750 Laser FAX	CALL
Sharp F0240	659
Sharp F0334	749

WIDE SELECTION

Huge inventory. Thousands of items in stock and ready for immediate shipment!

ON-TIME

In-stock orders are shipped the same day. We are fast & efficient.

RELIABILITY

We earn your business! Over 70% of our orders are repeat customers.

KNOWLEDGABLE

All of our salespeople are technically trained to provide you with the right solution!

SERVICE

If you don't find it, ask, our friendly staff will special order products for you!

PACKARD BELL

America grew up listening to us. It still does.

FORCE SX16

•386SX 16MB RAM	
•3 1/2" floppy	
•800x600 VGA	
•44MB hard drive	
•MS DOS 5.0 & GW Basic	
•FREE Lotus Works software	
•FREE 2400 baud modem	
•FREE Prody start-up kit	
•FREE 100% warranty	

\$979

PACKARD BELL

America grew up listening to us. It still does.

FORCE E20E

•386SX 20MHz 1MB RAM	
•16K cache memory	
•5 25" & 3 1/2" floppies	
•1024x768 512k video	
•44MB hard drive (optional)	
•65, 125, 210MB hard drives	
•FREE Lotus Works software	
•FREE PS/2 mouse	
•1 year on-site warranty	

\$1329

AST

RESEARCH INC.

PREMIUM EXEC 386SX/20

•386SX 20MHz 2MB RAM	
•Expandable to 6MB RAM	
•1 44MB built-in floppy	
•20MB HD (40 & 60MB opt)	
•VGA paper-white display	
•1-ser, 1-par, VGA mouse & keyboard ports	
•6.5" 9"D x 11.4"W x 2.2"H	

\$2449

TEXAS INSTRUMENTS

TM3000

2MB RAM

•Expandable to 6MB RAM	
•1 44MB built-in floppy	
•20MB HD (30 40 & 60MB opt)	
•VGA paper-white display	
•1-ser, 1-par, VGA mouse & numeric keypad ports	
•5.7" 8.5"D x 11.1"W x 1.8"H	

\$2549

COMPAQ

LTE 386/20

2MB RAM

•386SX 20MHz 2MB RAM	
•Expandable to 10MB RAM	
•1 44MB built-in floppy	
•30MB HD (60MB opt)	
•VGA paper-white display	
•1-ser, 1-par, VGA mouse, and keypad ports	
•7.8" 8.5"D x 11.1"W x 2.3"H	

\$3599



KXP-1124I

24-PIN DOT MATRIX PRINTER

- New EZ set LCD operator panel
- 300cps draft print speed w/12K buffer
- Front,

 Indicates Windows Compatible Products



MORE=LARGEST SELECTION OF SOFTWARE TITLES
LESS=LOWER PRICES AND LESS TIME WASTED TRYING TO FIND THEM



PCX-Pop Add photographs to your DOS applications instantly - without programming. PCX-Pop is an easy-to-use memory resident utility which allows you to "pop-up" full color PCX scanned images with just about any DOS text based application (Lotus 1-2-3, dBase, WordPerfect, etc.) simply by pressing a predefined "hot-key". PCX-Pop is suitable for many business or entertainment applications requiring scanned images.

30 DAY MONEY BACK GUARANTEE

New Product! \$99

CIRCLE 205 ON READER SERVICE CARD



Metalis/SX

Notebook PC

✓ 80C386SX Microprocessor, 16/8 MHz ✓ 1 MB RAM, Exp. to 2, Or 5 MB On Main Board ✓ 3.5" 1.44 MB ✓ 40 MB With Access Time Of 29ms ✓ LCD Screen B&W With 32 Gray Scale ✓ Keyboard Selectable Normal

Reverse Video Mode ✓ 640x480 Resolution ✓ 80 Key Keyboard ✓ Password Protection, Extended Expanded Memory Shadow RAM Power Management Options, Auto Mapping Bold Font Video Attribute Vertical Compensation And Width Compression ✓ System Also Includes: 2400 Baud Internal Fax/Modem, Mouse Pen, User's Manual, MS DOS 4.01, Custom Slip-Cover Carry Case, GeoWorks Ensemble And 110V Power Cord ✓ One Year Parts And Labor Warranty

CDW Price **\$1998.08**

WHY PAY RETAIL?

CDW Sells For Less

AND SERVICES YOU BETTER

MAGNAVOX

MAGNAVOX 7CM321

14" Super VGA Color Monitor

✓ Dual Frequency Analog Color Monitor Compatible w/VGA & Super VGA 1024 x 600 Resolution ✓ 60Hz Refresh Rate ✓ Anti-glare Screen with .28mm Dot Pitch ✓ Tilt & Swivel Base and Analog Video Cable

CDW Price **\$334.40**

HARDWARE, SOFTWARE & PERIPHERALS AT **DISCOUNT** PRICES

UNBELIEVABLE! COMPUTER VALUE!

MAGNAVOX 386SX/16

MX3100 Personal Computer



\$899.98

Smart. Very smart.®

MAGNAVOX MAXSTATION 386SX/16

MX64 CD MODEL Personal Computer

CDW Price

\$1359.30



MAXSTATION 386SX/20 Personal Computer

✓ 80386SX Processor ✓ 20 MHz ✓ 80 MB Hard Drive ✓ One 3.5" (1.44 MB) Floppy ✓ One 5.25" (1.2 MB) Floppy ✓ Super VGA On Motherboard ✓ 1024 x 768 Res. ✓ 2 MB RAM, 16 Max ✓ 4 16-Bit Expansion Slots ✓ Operating System MS-DOS 4.01, GW BASIC Programming Language, Lotus Magellan

✓ 2 Drive Cavities Available ✓ Larger, More Hi Tech Looking Box ✓ Publish It! Desktop Publishing Package ✓ Lotusworks Integrated Software Package ✓ 145 Power Supply ✓ 25 Pin Parallel Port, 9-Pin & 15-Pin Serial Port, 15-Pin Video Port ✓ 101-Key Keyboard ✓ 1 Year Parts and Labor Warranty, 6 Month On-Site Service

CDW Price **\$1274.41**

MAXSTATION 386SX/20 CD MODEL

✓ Same As Above With 1.44 Drive Only ✓ Internal CD Player ✓ CD Bundle (Groller's Electronic Encyclopedia, Microsoft Bookshelf, Microsoft Small Business Consultant, and Microsoft Stat Pack)

CDW Price **\$1595.40**

MAGNAVOX MAXSTATION 386/33 MX3300 Personal Computer

✓ 386DX CPU ✓ 33/8 MHz Speed ✓ 2 MB RAM Standard, Expansion to 64 MB ✓ Six 16-Bit Expansion Slots ✓ On-Board Clock/Calendar ✓ 101-Key Keyboard ✓ AT-IDE Hard Disk and Floppy Controller Built-In ✓ 1.44 MB High Density 3.5" Floppy Disk ✓ 1.2 MB 5.25" Floppy Disk ✓ 120 MB Hard Drive ✓ Analog Output Which Supports Extended VGA, Super VGA, VGA, EGA, MCGA, CGA, MDA, Hercules (1024 x 768 x 16) ✓ 512 K Video RAM ✓ 2 Serial, 1 Parallel, 1 Video Ports ✓ Novell Workstation and Server Approved Windows 3.0 Certified, SCO Certified (for UNIX and ODT) ✓ Operating System Software: MS-DOS 4.01, MS-DOS Shell, GW-BASIC, LIM EMS 4.0 Drivers ✓ Bundled Disk Software: LotusWorks (Integrated Software - Word Processor, Spreadsheet, Database, Graphics, Communications, Spell Checker, Thesaurus) Lotus Magellan (File Management Program) ✓ 1-Year Parts and Labor Warranty ✓ 6 Month Onsite

CDW Price **\$1838.37**

MAGNAVOX



AT CDW YOU GET MORE COMPUTING FOR YOUR BUCK. CALL NOW!

♦ CDW means Service ♦ CDW means Savings ♦ CDW means Business ♦ CDW means Experience
♦ CDW means Technology ♦ CDW means Networking ♦ CDW means Computing

PCM310

FREE TECHNICAL
SUPPORT FOR CDW
CUSTOMERS.

(800) 326-4CDW
WE SELL NAME BRANDS FOR LESS!

1991 MPK Computing, Inc.

ALWAYS WORKING TO
KEEP YOUR COMPUTING
ONE STEP AHEAD.



COMPUTER DISCOUNT WAREHOUSE



CF-370/H6

Notebook Size Laptop Computer
 • 20 MHz, 80386SX Processor • 1 MB Of RAM • 1.44MB Floppy Drive • 60MB Hard Drive • 84-Key Keyboard • Backlit Triple Supertwist LCD Screen

CDW Price

\$2996.77



Panasonic
 60 MB HARD DRIVE

60 MB HARD DRIVE

WHY PAY RETAIL?

CDW Sells For Less

AND SERVICES YOU BETTER

EPSON

Action Laser II

• 6 Pages Per Minute • 512 K Standard • HP IIP, Epson FX NLQ Emulation • Expandable to 5.5 on Motherboard • HP Compatible Font Slot • Serial and Parallel Auto Sensing Ports

CDW Price

\$687.00

EPSON IS CHANGING THE MARKET OF HIGH QUALITY LOW PRICE LASERS



NEW

HARDWARE, SOFTWARE & PERIPHERALS AT DISCOUNT PRICES

COMPUTERS

MAGNAVOX
 MAGNAVOX SX16 40MB VGA Ad. 2 Dr. \$299.99
 MAGNAVOX SX16 40MB CD-ROM. 1359.30
 MAGNAVOX SX20 80MB, 2 MB, VGA, 2 Dr. 1274.41
 MAGNAVOX SX20 80MB, Int. CD-ROM. 1595.40
 MAGNAVOX 386SX 130MB, Ext. VGA, 2MB 2 Dr. 1838.37
 MAGNAVOX 286 VGA Notebook 20MB. 1538.89
 MAGNAVOX 386SX16 VGA Notebook 40MB. 1998.08

PACKARD BELL

Packard Bell 286 Notebook. \$1595.44
 Force 486/25, 130 MB HD, 2 Drive, VGA. 3058.33
 Force SX16, 44 MB, VGA, Interleaved. 1029.32
 Force SX 20 MHz, 106 MB, VGA, 2 Drives. 1479.61
 Force SX 20 MHz, 130 MB, 2 Dr. Modem. 1672.25
 Force SX 20 MHz, 210 MB, 2 Dr. Fax Board. 1998.70
 386SX16 Notebook 40MB, 2 MB RAM. 1979.22

Panasonic

CF170 XT 16MHz 20MB Notebook Laptop. \$1993.55
 CF 270 286 16MHz 20MB VGA Notebook. 1548.38
 CF 270 286 16MHz 60MB VGA Notebook. 1897.85
 CF 370 386SX 20MHz 60 MB VGA Notebook. 2085.77

ALR

ALR 386/33 Model 101. \$1629.25
 ALR Power Versa 486/33 101. 4599.78
 ALR PowerFlex 386SX Model 1. 829.11

COMPAQ

LTE 286 M3 20. \$1174.00 DP386/20E M3 1. \$2297.45
 LTE 286 M3 40. 1815.22 DP386/33 M3 1. 3282.32
 LTE 386 60 MB. 3838.00 CPQ 386/33 L. CALL
 DP386/33 M3 1. 1709.20 SLT 386/32 M3 60 4129.26

SAMSUNG

SAMSUNG S0716 386SX 16 Base. \$97.27
 SAMSUNG Notemaster SX16 40 MB. 2495.42

TEXAS INSTRUMENTS

TEXAS INSTR. TravelMate 2000. \$1898.11
 TM 3000 SX Notebook 30 MB. 2839.31
 TM 3000 SX Notebook 40 MB. 3078.49
 TM 3000 SX Notebook 60 MB. 3363.73

HP, IBM & COMPAQ MEMORY

1MB IBM Module CPQ 386 386S, 20/25E. \$97.40
 2MB Memory Board CPQ LTE 286. 158.83
 4MB Memory Board CPQ LTE 286. 431.25
 4MB Memory Card CPQ LTE 386S. 616.89
 2MB Memory Board CPQ SLT 386. 195.00
 4MB Memory Board CPQ SLT 386. 399.00
 8MB Memory Mod CPQ Desktop/Sys Pro. 595.80
 4MB Module CPQ 386 386S, 20E/25E. 253.24
 4MB CPQ Exp. Bd. 386S, 20E/25E. 299.95
 1 MB AST Cupid Simms. 66.33
 4 MB AST Cupid Simms. 246.25
 AST Exec 386SX 4 MB Module. 249.75
 2MB Upgrade HP LaserJet II/IIi. 195.32
 1MB Upgrade HP LaserJet II/IIi. 89.40
 2MB Upgrade HP LaserJet II/IIi. 185.32
 4MB Upgrade HP LaserJet II/IIi. 295.00
 IBM Personal System II Memory. CALL
 2MB Memory Module IBM PS/2 Mod 7050Z. 142.85
 1MB OKI Laser 400. 102.59

KINGSTON FOR TOSHIBA

2MB 1200XK. \$149.35 4MB 3100XK. \$324.67
 2MB 3100SX. 149.35 4MB 3200SX. 149.35
 4MB 3200SX. 324.67 3MB 3200. 273.00
 2MB Memory Module TOSHIBA 5200. 149.35
 8MB Memory Module TOSHIBA 5200. 599.00

WYSE TERMINALS

WYSE 50/60 Amber or Green. \$346.15/279.92
 WYSE 180/30 Amber or Green. 321.98/274.89
 WYSE 185 VT320 Amber, Green or White. 345.60
 WYSE 150 Amber, Green or White. 260.45

MATH COPROCESSORS

INTEL 387DX 16/20/25/33. \$198.25
 INTEL 387SX 16/20/25. 124.25/134.25
 INTEL 287XL/287XL. 84.00/84.00
 CYRIX FasMath SX16/SX20. 118.00/129.50
 CYRIX FasMath DX16/20/25. 178.50
 CYRIX FasMath 287 8-20 MHz. 83.50
 CYRIX FasMath DX33 MHz. 188.50

MOST ORDERS RECEIVED BY 5:00 P.M. C.S.T. SHIP SAME DAY

DOT MATRIX & LASER PRINTERS

EPSON
 Lx810. \$154.00 X850. \$289.00
 LQ870. 435.00 EPL 7000 Laser. 780.00
 LQ2550. 859.00 EPL 7500 Laser PS. 1988.00
 FX1050. 399.00 LQ1170. 596.00
 LQ1200. 225.00 LQ1370. 259.00
 Action Laser II 6PPM 987.00 LQ1070. 349.00

NEC
 Starterwriter 90. \$1549.50 P6300 New Model. \$623.11
 P6200 24-pin. 467.74 P3200 24-pin. 267.74
 P3000 24-pin. 374.19 P6000. 889.21

DIGICOLOR BY KODAK

150 Parallel 150 Serial. \$329.07 / 338.07

OKIDATA
 ML182 Turbo. \$226.56 ML300+. \$438.22
 OKILASER 400. 585.96 ML391+. 596.41
 OKILASER 800. 626.96 ML380. 224.61
 OKILASER 830. 1314.50 ML383+. 337.20
 OKILASER 840. 1594.50 ML393 + Color. 999.50
 ML320. 314.68 ML321. 438.44

Panasonic
 11241. \$279.69 1534. \$343.93
 1123. 225.00 11901/654. 149,909.85
 1695. 360.21 2624. 436.56
 4450 Laser. 1099.12 4455 PostS. Laser. 1769.78
 4420 Laser Printer. 789.50

HEWLETT PACKARD

H-P LaserJet Model III. \$2379.22
 H-P Deskjet 500H-P LaserJet IIP. 474,506.95
 H-P LaserJet II. 1548.00 H-P LaserJet III. CALL
 H-P Partner. 573.00 H-P Partner XL. 1648.35
 H-P LaserJet IIIP. 1028.00
 CANON BJ10E Bubble Jet. 323.58
 CITIZEN GSX 140. 299.44
 CMS P5410. 1977.00

PACIFIC DATA 25 in 1 Cart. LAS3. \$258.00
 PACIFIC DATA Page Postscript 4 HP LAS3. 344.44
 PACIFIC DATA Connect 1.2 MB. 169.00
 PACIFIC DATA 1 MB Upgrade for LaserJet II. 169.00
 PACIFIC DATA 1 MB for 2P / II. 108.46
 POSTSCRIPT CART W/2MB HP LAS3. 339.00
 CPJ JETMEMORY 1MB for HP/HP/III. 107.80
 CPJ JETPAGE for HP II/III/III Postscript. 208.72
 CPJ JETRESET + 425 Fonts for all HP Laser. 208.72

DRIVES, TAPES & CARDS

COMPAQ 360KB (SLT). \$179.00
 COMPAQ 1.2 MB/360KB (SLT). 209.00
 COMPAQ 360KB (LTE). 209.00
 COMPAQ 1.2 MB/360KB (LTE). 209.00
 CONNER 44 MB / 120 MB. 199.00/389.90
 CONNER 44 MB / 204 MB. 357.55/605.88
 IOMEGA B800/900trane. 787.90/799.50
 PLUS Hardcard IXL 105MB. 589.46
 PLUS Hardcard IXL 50 MB. 369.80
 SYSGEN 6.25 / 7.5 External Floppy. 206.25
 FLUCC RIM 5.25 External Floppy for Laptops. 185.56
 TOSHIBA 1.2 MB/360KB. 179.00
 TOSHIBA 1.2 MB/360KB. 189.00

Seagate

ST225 20 MB. \$190.23 SEAGATE 4007 80. \$348.37
 ST238 30 MB. 180.23 SEAGATE ST-2511. 236.05
 ST2363E. 1178.16 ST4766E. 676 MB. 1585.22
 1102A 84 MB. 305.88 ST1574 44 MB 3.5. 182.18
 ST1144A 124 MB IDE. 409.29
 ST1239A 211 MB IDE. 609.67

MICROPOLIS

1664 7.34MB HH. \$147.67 1664-7 340 MB. \$1209.95
 1664 4. 1064.44

SURGE SUPPRESSORS

DATASHIELD S100. \$59.55
 DATASHIELD S85. 53.95
 KENSINGTON MP+. 96.00

MODEMS & COMMUNICATIONS

Intel
 2400 Internal. \$137.75 2400 External. \$163.94
 2400B MNP. 179.98 2400 External MNP. 207.69
 9600 External. 467.40 PS/2 Internal 2400. 223.22

PRACTICAL PERIPHERALS

2400 V.42 Int. \$158.81 2400 Int. \$79.48
 2400 V.42BIS Ext. 187.50 2400SA. 163.63
 9600 V.32-42BIS. 433.58 Pocket 2400. 98.00

HAYES

2400 External. \$323.84 2400B Internal. \$224.45
 ULTRA 9600 External. 809.98
 Optima 9600 V.32. 439.50
 Hayes Packet Express. 117.92

E-Robotics

Courier 2400. 264.61 V.32 9600E. 567.80
 Dual 14,400 HST. 788.65 14,400 HST. 567.77

MHz

2400 for TOSHIBA 127.33 2400 for COMPAQ LTE \$16421
 CPI VIVA 2400 Internal/9600 External. 79,404/429.82
 CPI VIVA 2400 External Faxmodem. 90.40
 CPI VIVA 2400 External Hardware MNP. 139.73

MULTITECH

MULTI-TECH 224EH 2400 Ext. \$298.93
 MULTI-TECH 666EA 9600. 472.32
 MULTI-TECH MT932EAB 9600. 512.82

BOARD & COMM PRODUCTS

AST 3291 11 + Enhanced Local. \$449.75
 DIGIBOARD PC/BI Intelligent 8 Serial. 799.60
 DIGIBOARD PC/BI Intelligent 16 Serial. 1172.34
 KINIS/TON 386SX Now. 349.75
 EVEREX 2400 Internal Modem. 78.75
 EVEREX 2400 External MNP w/SLT. 188.88
 EVEREX 2400 MNP Internal. 145.34
 IRMA III 3270 XT/AT/PS/2. 399.60
 WORLD PORT Modem/Fax Ext. 312.90
 AST SatPac 286 3K. 96.60
 IRTS Above Board Plus 8 w/2 MB. 297.71
 INTEL Above Board Plus 512K. 279.16
 INTEL Inboard 386/PC. 469.60
 INTEL SatFax/Ext Fax Board. 374.50
 INTEL Snap In 386SX/20. 359.52

BATTERY BACKUP AND UPS

AMERICAN
 AME-1200VX. \$735.95 AME-620ES. \$311.38
 AME-360SX. 204.54 AME 800RT. 552.80
 AME-480AT. 257.81 AME-600LS. 434.68
 AME-Smart 400. 307.95 AME-Smart 900. 609.12

BC-275

BC-275. \$163.41 BC-500 LAN. \$278.24
 BC-375. 198.54 BC-750 LAN. 458.61
 BC-500. 259.76 Omni 450 LAN. 299.54

MICE

Super Mouse II w/Windows. \$79.75
 LOGITECH ScanMan PC/Scanman 256. 177.89/296.45
 LOGITECH Trackman Serial. 78.82
 MICROSOFT Mouse (Bus Version). 95.50
 MICROSOFT Mouse (Serial Version). 85.50
 MICROSOFT Mouse w/Windows 3.0. 144.95
 MICROSOFT Ball Point Mouse. 118.90
 MICROSOFT Serial, No Software. 78.80
 LOGITECH Mouseman Serial. 89.35
 LOGITECH Mouseman PS/2. 89.35
 LOGITECH Mouseman Bus. 89.35
 LOGITECH Mouseman Cordless. 105.54

WINDOWS SOFTWARE

MICROSOFT Windows 3.0. \$92.75
 ADOBE TypeManager for Windows. 63.50
 ALDUS PageMaker 4.0 for Windows 3.0. 489.10
 ASYMETRIX Toolbook. 279.00
 BITSTREAM Facelt for Windows. 58.50
 BUMBLEBEE DB Fast for Windows. 128.75
 CAERE Omnipage 386. 199.48
 CAERE Omnipage Professional. 590.42
 CALERA Wordscan + for Windows. 590.42
 COREL SYSTEMS Corel Draw. 365.55
 CROSSTALK for Windows 3.0. 118.85
 DELRINA Per. Form Pro for Windows 3.0. 299.84
 DELRINA Per. Form Pro Filter for Windows. 119.42
 EMF IFC Anywhere IV. 96.80
 HCC First Apps for Windows 3.0. 48.51
 HCC Windows Express. 48.51
 IBM Current for Windows. 217.73
 INFORMIX Window for Windows. 299.20
 LOTUS AMI for Windows 3.0. 121.59
 LOTUS AMI Professional for Windows 3.0. 283.61
 MICROGRAFX Designer 3.1 for Windows. 439.95
 MICROGRAFX X Port for Windows 3.0. 134.42
 MICROGRAFX Draw for Windows 3.0. 148.98
 MICROGRAFX Charisma. 309.23
 MICROSOFT Excel for Windows V3.0. 297.00
 MICROSOFT PowerPoint for Windows 3.0. 297.85
 MICROSOFT Productivity Pack for Windows. 38.20
 MICROSOFT Project for Windows 3.0. 418.88
 MICROSOFT Windows 3.0 Developers Kit. 297.20
 MICROSOFT Word for Windows 3.0. 297.88
 PRECISION SFT Superbase 4 for Windows. 399.33
 REFERENCE Grammatik for Windows. 54.36
 SPINAKER Works for Windows. 123.48
 XEROX Ventura Gold for Windows 3.0. 479.24
 XEROX Formbase for Windows. 298.33
 ZSOFT Soft Type Fonts. 106.86

MONO & COLOR MONITORS

CDW Color Mono Cards w/P. 59.00
 SAMSUNG 12" Amber. \$41.10
 SAMSUNG 14" White. 99.88
 SAMSUNG RGB Color. 196.40

VGA & EGA PRODUCTS

VGA & EGA MONITORS
 CALCOMP 3690 20" MultiSync 1280 x 1024. CALL
 MAGNACOLOR Super VGA 28mm 70M321. 334.40
 MAGNAVOX CM9032 42mm VGA Color. 249.50
 MAGNAVOX 78M749 Mono 14" VGA. 119.50
 NEC MultiSync 40S/50. 538.56 / 2198.34
 NEC MultiSync 2A / MultiSync 3DS. 407.80 / 569.70
 PACKARD BELL 8508 42mm. 229.57
 PACKARD BELL 8509 31mm. 279.99
 PANASONIC C1381 1024X768 14". 339.75
 PACKARD BELL 8528 1024X768. 336.88
 SAMSUNG 14" White VGA. 116.50
 SAMSUNG VGA 28mm CVB4907. 335.42
 SAMSUNG CSA 7571 17". 806.92
 Sony 1020 / 1304. 429.50 / 588.08
 ZENITH 21482. 524.17

VGA & EGA DISPLAY CARDS

ATI VGA Wonder XL 1 MB/512K. \$279.63/219.32
 ATI Graphics Ultra 1 MB/512K. 564.04/435.86
 ATI Integra. 99.38 ATI Basic 16 VGA. 77.19
 ATI ISA Ultra 1. 509.11
 ATI Vantage 1MB/512K. 378.00/225.62
 BOGA Basic VGA. 64.50
 PARADISE 1024 x 256K 512K. 145.63/207.36
 PARADISE VGA / VGA + 16. 100.54/133.33
 ORCHID ProDesigner IS 512K. 198.18
 ORCHID ProDesigner IS 1MB. 250.82
 VIDEO 7 1024 x 512K/256K. 149.53/125.88
 VIDEO 7 VRAM II VGA 1MB. 319.79
 VIDEO 7 VRAM II VGA 1MB. 250.22
 VIDEO 7 VGA 16. 98.41

CDW EXTENDED HOURS

11:00 AM - 7:00 PM CST Mon-Fri
 Tech Support 8:00-7:00 CST Mon-Fri

Small Credit charges are not submitted until time of shipment. Shipping and handling additional. On all orders received under \$500.00 please call 800-447-4477 for non-delivery returns subject to restocking fee. All prices subject to change without notice. Allow 10 business days for shipping when placing the personal data software chips and other electronic components are included. Shipping subject to change. * Requested replacement of 90 day and 1 year warranty.

©1991 MPK Computing Inc.



IF YOU FIND A BETTER PRICE CALL US BEFORE YOU BUY
 2940 MAPLE, NORTHBROOK, IL 60062 FAX (708) 291-1737

WHY WAIT? CALL COMPUTER DISCOUNT WAREHOUSE™ NOW!
 WE SELL NAME BRAND ITEMS FOR LESS!

(800) 326-4CDW

In Illinois FAX
 (708) 498-1426 (708) 291-1737

CIRCLE 109 ON READER SERVICE CARD

PC Magazine says... "You may find a better deal here than anywhere else."

Apply for the CDW Credit Card

High Volume Bids Invited

Microcomputer Marketing Council

COMPUTER DISCOUNT WAREHOUSE™
 SERVING YOUR PC NEED SINCE 1983. DON'T ACCEPT ANY IMITATIONS.

BUY
HDI



HARD DRIVES AND PERIPHERALS

NEW
LOWER
PRICES



FOR THE BEST
PRICE, SERVICE
& SUPPORT
CALL:

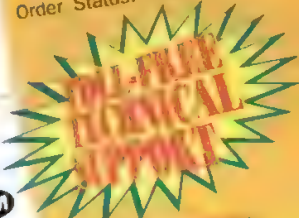
800/767-DISC

HDI SALES: 800/767-3472
or 602/350-1128
FAX 602/829-9193

NATIONAL ACCOUNTS
Purchase Orders
800/733-0882
FAX 602/350-1180

International: 602/350-1144
FAX 602/350-1188

AP0/FPO: 602/350-1145
Order Status: 800/729-4490



Prices and availability subject to change without notice. Items are NEW. PO's from qualified buyers. Add \$13 shipping for EPO/FPO orders. PO's Guarantee and 1-Year Return Policy may have restrictions. Shipping refundable. All trades are the properties of respective owners.

Hard Drives Int'l
Insight Distribution
1912 W. 4th St.
Tempe, AZ

MICROPOLIS

HIGH CAPACITY - HIGH SPEED
COMPLETE ESDI AND SCSI KITS

ESDI
340Mb MC1664
15ms 5.25" HH
Bare Drive \$1149
16 Bit Kit \$1299

ESDI
660Mb MC1568
16ms 5.25" FH
Bare Drive \$1649
16 Bit Kit \$1749

SCSI
1 GIG
HS MC1598
14ms 5.25" FH
Bare Drive \$2299
16 Bit Kit \$2399

SCSI
1.5 GIG
HS MC1528
14ms 5.25" FH
Bare Drive \$2799
16 Bit Kit \$2899

CONNER PERFORMANCE KITS

IDE
40Mb CP3000
25ms 3.5" 1"H
16 Bit Kit \$229

IDE
80Mb CP3184
25ms 3.5" HH
16 Bit Kit \$379

IDE
120Mb CP30104
16ms 3.5" 1"H
16 Bit Kit \$399

IDE
209Mb CP3204
16ms 3.5" HH
16 Bit Kit \$669

Maxtor

IDE
80Mb MX7080A
17ms 3.5" 1"H
(SCSI available)
Bare Drive \$289
16 Bit Kit \$299

IDE
210Mb MX213A
15ms 3.5" HH
(SCSI available)
Bare Drive \$619
16 Bit Kit \$639

ESDI SCSI
340Mb MX8380E
16ms 5.25" FH
Bare Drive \$1199
16 Bit Kit \$1299

ESDI SCSI
660Mb MX8760E
16ms 5.25" FH
Bare Drive \$1599
16 Bit Kit \$1699

Seagate

IDE
40Mb ST157A
28ms 3.5" HH
Bare Drive \$179
8 Bit Kit \$199
16 Bit Kit \$199

IDE
60Mb ST277R-1
28ms 5.25" HH
Bare Drive \$249
8 Bit Kit \$299
16 Bit Kit \$319

IDE
89Mb ST1102A
19ms 3.5" HH
Bare Drive \$289
16 Bit Kit \$299

IDE
125Mb ST1144A
19ms 3.5" HH
Bare Drive \$379
16 Bit Kit \$399

IMPRIMIS

IDE
210Mb ST1239A
15ms 3.5" HH
Bare Drive \$599
16 Bit Kit \$619

SCSI
340Mb ST4376N
17 5ms 5.25" FH
Bare Drive \$1199
16 Bit Kit \$1349

ESDI
660Mb ST4766E
15 5ms 5.25" FH
Bare Drive \$1599
16 Bit Kit \$1699

1 GIG!
1050Mb ST41200N
15ms 5.25" FH
Bare Drive \$2199
16 Bit Kit \$2349

KLÖK

MFM
20Mb KL320
40ms 3.5" HH
Bare Drive \$129
8 Bit Kit \$169

RLL
30Mb KL330
40ms 3.5" HH
Bare Drive \$139
8 Bit Kit \$189

IDE
40Mb KL343
30ms 3.5" HH
Bare Drive \$169
8 Bit Kit \$189

ALL BARE DRIVES INCLUDE:
All mounting hardware "Disk Manager"
formatting partitioning software (40Mb+),
and HDI's Hard Drive Reference Manual
with complete installation instructions.

ALL KITS INCLUDE:
16-Bit host adaptor hard floppy 1 to 1"
controller or interface card, mounting
kit (3 1/2" kit inc beige & black bezels),
cables, all mounting hardware, "Disk
Manager" software (40Mb+) and manual.

TAPE BACKUP



With data compression. AmigaLink to
existing backup systems. Super-fast
QC (no standard 20 sec. AHA per
minute) format units. 100%.

120Mb/250Mb
Internal Unit \$279
(Inc. 1 80Mb tape) \$26
80Mb Tape \$29
120Mb Tape \$29

CD ROM DRIVES

YOUR OPTICAL EXPERTS
Ask about software!

600Mb CHINON \$429 \$569
TOSHIBA \$619 \$699

MEMORY

ADD 1Mb RAM
AS LOW AS \$39

SIMM

1Mb x8 80ns \$39
1Mb x9 80ns \$49
Add \$2 for SIP

CALL TODAY! WE CARRY
MEMORY FOR EVERY SYSTEM!

HARD DRIVES International

800/767-DISC

PURCHASE ORDERS/NATIONAL ACCOUNTS 800/733-0882

HARD DRIVES
International

Another
Insight
Company



LANtek Makes Networking Simple

The one stop shop for your network

Experience and Expertise

For those seeking to establish a network or enhance an existing place to call. Our experience with LANs spans over 6 years and custom configure the LAN that suits your current needs, and grows in the future.

Factory-Direct

When you buy from LANtek, you are buying factory-direct, so there's no middle man. You get the quality, reliability, and features you want, at a savings.

Plug and Play

Our LANs come pre-configured the way you wanted. All you have to do is connect the cable and you have got a LAN that is ready to fly.

Services and Support

LANtek provides on-line modem support from our staff of knowledgeable technicians. Or simply call our Emergency Customer Support Center. Your call will get into response a sophisticated on-line or on-site support system anywhere, at a fraction of the cost of your system.

Warranty and Guarantee

Use only the best components, we proudly offer all products with an unbeatable life time warranty on labor. All LANtek networking interface cards carry 5 year warranty on parts, and all others carry 1 year on parts. We stand by our products with a 30 day money back guarantee.

STANDARD CONFIGURATION CHART

Add LANtek Server/Station price to the monitor/disk combination of your choice.

Model	Samsung Monitor Mono 720X348	Samsung Super VGA Color 1024X768
40MB/25MS Conner IDE	• 345	• 685
120MB/18MS Conner IDE	• 575	• 915
150MB/18MS NEC ESDI	• 775	• 1,115
200MB/18MS Conner IDE	• 895	• 1,235
345MB/14MS Micropolis ESDI	• 1,595	• 1,935
650MB/14MS Micropolis ESDI	• 2,295	• 2,635

LANtek Server/Station Features:

- Intel Processor
- 1 MB Zero wait state memory
- Expandable to 16 MB
- Support Intel Math Co-processor
- 101-key enhanced keyboard
- 1.44 or 1.2 floppy disk drive
- IDE dual floppy and hard drive controller
- 2 serial and 1 parallel port
- Mini Vertical or Slim line case
- 200+W CSA, UL, TUV approved power supply

LANtek SERVER AND STATION

Model	Price
486-33	• 1,895
486-25	• 1,595
486-SX	• 1,495
386-33	• 1,145
386-25	• 895
386-SX	• 735
286-16	• 535
Diskless	• 395

NETWORKING

Novell NetWare	• Call
Novell Certified ARCnet 8 bit card	• 85
Novell Certified ARCnet 16 bit WS card	• 135
Novell Certified ARCnet 16 bit FS card	• 175
Thomas Conrad 100Mbps ARCnet card	• 1295
Thomas Conrad Fiber Optic Hub	• 1995
LANtek Active HUB (Coaxial)	• 195
LANtek Active HUB (Twist Pair)	• 195
Novell Certified Ethernet 8 bit Card	• 139
Novell Certified Ethernet 16 bit Card	• 169
Novell NE1000 Ethernet 8 bit Card	• 169
Novell NE2000 Ethernet 16 bit Card	• 199
Novell Digital EtherCard Plus 16-bit	• 199
Novell 16 bit 10base T Ethernet Card	• 199

LANtek 8 bit 10base T Ethernet Card	• 179
LANtek 12 port 10base T Concentrator	• 745
SynOptics 504-st Fiber Optic Transceiver	• 495
3Com 3C503 EtherLink II Card	• 269
Proton Token Ring products	• Call
American Power 520VA (360W) UPS	• 395
American Power UPS Monitor Card/Cable	• 85
Colorado 120MB Tape Backup Drive	• 295
Colorado 250MB Tape Backup Drive	• 345
Colorado 700MB Tape Backup Drive	• 1195
LAN Modem Sharing Software	• 295
LAN 9600 Fax Sharing Hardware & Software	• 895
ARCnet Laptop/Notebook LAN Adapters	• 210
Ethernet Laptop/Notebook LAN Adapters	• 295

TESTED AND APPROVED
NetWare Compatible

Contact the vendor of this product for configurations tested and approved
122 East 4700 South, Provo, Utah 84606



We're Novell Gold Authorized Dealer all of our computer systems are 100% compatible with Novell SCO XENIX and etc. Our technical staff can help you plan and equip your network system including all network hardware and software.

TO ORDER CALL: 1 (800) 462-0436

LANtek
Computer, Inc.

661 Brea Canyon Road, Ste #3
Walnut, CA 91789

- 30 Day Money Back Guarantee (Excluding shipping & software)
- We accept VISA, MasterCard, COD or Purchase Order.
- Corporate, Dealer Accounts Welcome.

All systems are fully compatible with MS-DOS, OS/2, NOVELL, XENIX, and Pick. All companies and product names are trademarks of their respective companies. Netware are sold in California Only.

CIRCLE 171 ON READER SERVICE CARD

Technical Support/General Information:
(800) 594-9491

Order: (714) 594-6490

HOURS: Mon thru Fri: 8 a.m. to 6 p.m.
is subject to change without notice.

BUY
HDI



A RECOGNIZED LEADER!

HARD DRIVES AND PERIPHERALS



FOR THE BEST
PRICE, SERVICE
& SUPPORT
CALL:

800/767-DISC

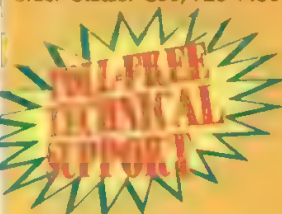
HDI SALES: 800/767-3472
or 602/350-1128
FAX 602/829-9193

NATIONAL ACCOUNTS
Purchase Orders
800/733-0882
FAX 602/350-1180

International: 602/350-1144
FAX 602/350-1188

APO/FPO: 602/350-1145

Order Status: 800/729-4490



Prices and availability subject to change without notice. All items are NEW. PO's accepted from qualified buyers-Net 20. Add \$13 shipping for EXPRESS APO/FPO orders. PO's, 30-Day Guarantee and 1-Year Replacement Policy may have some restrictions. Shipping is non-refundable. All trademarks are the properties of their respective owners. HKT

Hard Drives International
Insight Distribution Network, Inc.
1912 W. 4th St., Dept. HKT
Tempe, AZ 85281

QUANTUM

52Mb LPS **IDE**
12ms* 3.5" 1"H
Bare Drive \$229
16 Bit Kit \$249

105Mb LPS **IDE**
9ms* 3.5" 1"H
Bare Drive \$379
16 Bit Kit \$399

210Mb **IDE**
12ms* 3.5" HH
Bare Drive \$679
16 Bit Kit \$699

*With 64K cache.

Maxtor

80Mb **IDE**
MX7080A
17ms 3.5" 1"H
(SCSI available)
Bare Drive \$289
16 Bit Kit \$299

210Mb **IDE**
MX213A
15ms 3.5" HH
(SCSI available)
Bare Drive \$619
16 Bit Kit \$639

340Mb **ESDI SCSI**
MX8380E
16ms 5.25" FH
Bare Drive \$1199
16 Bit Kit \$1299

660Mb **ESDI SCSI**
MX8760E
16ms 5.25" FH
Bare Drive \$1599
16 Bit Kit \$1699

CD ROM DRIVES

YOUR OPTICAL EXPERTS
Ask about software!

600MB Internal External
CHINON \$429 \$569
TOSHIBA \$619 \$699

MICROPOLIS

HIGH CAPACITY - HIGH SPEED
COMPLETE ESDI AND SCSI KITS

340Mb **ESDI**
MC1664
15ms 5.25" HH
Bare Drive \$1149
16 Bit Kit \$1299

660Mb **ESDI**
MC1568
16ms 5.25" FH
Bare Drive \$1649
16 Bit Kit \$1749

1 GIG **SCSI**
HS MC1598
14ms 5.25" FH
Bare Drive \$2299
16 Bit Kit \$2399

1.5 GIG **SCSI**
HS MC1528
14ms 5.25" FH
Bare Drive \$2799
16 Bit Kit \$2899

Seagate IMPRIMIS

40Mb **IDE**
ST157A
28ms 3.5" HH
Bare Drive \$179
8 Bit Kit \$199
16 Bit Kit \$199

60Mb **IDE**
ST277R-1
28ms 5.25" HH
Bare Drive \$249
8 Bit Kit \$299
16 Bit Kit \$319

89Mb **IDE**
ST1102A
19ms 3.5" HH
Bare Drive \$289
16 Bit Kit \$299

125Mb **IDE**
ST1144A
19ms 3.5" HH
Bare Drive \$379
16 Bit Kit \$399

210Mb **IDE**
ST1239A
15ms 3.5" HH
Bare Drive \$599
16 Bit Kit \$619

340Mb **SCSI**
ST4376N
17.5ms 5.25" FH
Bare Drive \$1199
16 Bit Kit \$1349

660Mb **ESDI**
ST4766E
15.5ms 5.25" FH
Bare Drive \$1599
16 Bit Kit \$1699

1 GIG!

1050Mb **SCSI**
ST41200N
15ms 5.25" FH
Bare Drive \$2199
16 Bit Kit \$2349

ALL BARE DRIVES INCLUDE
All mounting hardware, "Disk Manager"
formatting, partitioning software (40Mb+),
and HDX's Health Error Recovery Manual
with complete installation instructions.

COMPLETE INSTALLATION

ALL KITS INCLUDE:
16-Bit host adaptor hard floppy "1 to 1"
controller or interface card, mounting
kit (3.5" kit inc. beige & black bezels),
ralls, cables, all mounting hardware, "Disk
Manager" software (40Mb+), and manual.

EVERYTHING YOU NEED!

TAPE BACKUP

Insight

With 10th generation Attaches to
existing floppy controller. Super fast.
QIC 80 standard 2 to 4Mts per
minute! Externally mounted.

120Mb/250Mb
Internal Unit \$279
(Inc. 1 80Mb tape)
80Mb Tape \$26
120Mb Tape \$29

CONNER

PERFORMANCE KITS

40Mb CP3000 **IDE**
25ms 3.5" 1"H
16 Bit Kit \$229

80Mb CP3184 **IDE**
25ms 3.5" HH
16 Bit Kit \$379

120Mb CP30104 **IDE**
16ms 3.5" 1"H
16 Bit Kit \$399

209Mb CP3204 **IDE**
16ms 3.5" HH
16 Bit Kit \$669

KLONK

20Mb KL320 **MFM**
40ms 3.5" HH
Bare Drive \$129
8 Bit Kit \$169
PS 2 Models
25, 30 Kits \$199

30Mb KL330 **RLL**
40ms 3.5" HH
Bare Drive \$139
8 Bit Kit \$189
PS 2 Models
25, 30 Kits \$209

40Mb KL343 **IDE**
30ms 3.5" HH
Bare Drive \$169
8 Bit Kit \$189

MEMORY

ADD 1Mb RAM
AS LOW AS \$39

SIMM

1Mb x8 80ns \$39
1Mb x9 80ns \$49

Add \$2 for SIP

CALL TODAY! WE CARRY
MEMORY FOR EVERY SYSTEM!

HARD DRIVES International

Another
Insight
Company

Insight

800/767-DISC

PURCHASE ORDERS/NATIONAL ACCOUNTS 800/733-0882

HARD DRIVES
International

LANtek Makes Networking Simple As 1.2.3.

The one stop shop for your networking needs.

▲ Experience and Expertise

For those seeking to establish a network or enhance an existing one, LANtek is the place to call. Our experience with LANs spans over 6 years. We can design and custom configure the LAN that suits your current needs, and yet, has room to grow in the future.

▲ Factory-Direct

When you buy from LANtek, you are buying factory-direct, so there's no middle-man. You get the quality, reliability, and features you want, at a substantial saving.

▲ Plug and Play

Our LANs come pre-configured the way you wanted. All you have to do is connect the cable and you have got a LAN that is ready to fly.

▲ Services and Support

LANtek provides on-line modem support from our staff of knowledgeable technicians. Or simply call our Emergency Customer Support Center. Your call will set into response a sophisticated on-line or on-site support system anywhere, at a fraction of the cost of your system.

▲ Warranty and Guarantee

Use only the best components, we proudly offer all products with an unbeatable life time warranty on labor. All LANtek networking interface cards carry 5 year warranty on parts, and all others carry 1 year on parts. We stand by our products with a 30 day money back guarantee.

STANDARD CONFIGURATION CHART

Add LANtek Server/Station price to the monitor/disk combination of your choice.

Model	Samsung Monitor Mono 720x348	Samsung Super VGA Color 1024x768
40MB/25MS Conner IDE	• 345	• 685
120MB/19MS Conner IDE	• 575	• 915
150MB/16MS NEC ESDI	• 775	• 1,115
200MB/18MS Conner IDE	• 895	• 1,235
345MB/14MS Micropolis ESDI	• 1,595	• 1,935
650MB/14MS Micropolis ESDI	• 2,295	• 2,635

LANtek Server/Station Features:

- Intel Processor
- 1 MB Zero wait state memory
- Expandable to 16 MB
- Support Intel Math Co-processor
- 101-key enhanced keyboard
- 1.44 or 1.2 floppy disk drive
- IDE dual floppy and hard drive controller
- 2 serial and 1 parallel port
- Mini Vertical or Slim line case
- 200+W CSA, UL, TUV approved power supply

LANtek SERVER AND STATION

Model	Price
486-33	• 1,895
486-25	• 1,595
486-SX	• 1,495
386-33	• 1,145
386-25	• 895
386-SX	• 735
286-16	• 535
Diskless	• 395

NETWORKING

Novell NetWare	• Call
Novell Certified ARCnet 8 bit card	• 85
Novell Certified ARCnet 16 bit WS card	• 135
Novell Certified ARCnet 16 bit FS card	• 175
Thomas Conrad 100Mbps ARCnet card	• 1295
Thomas Conrad Fiber Optic Hub	• 1995
LANtek Active HUB (Coaxial)	• 195
LANtek Active HUB (Twist Pair)	• 195
Novell Certified Ethernet 8 bit Card	• 139
Novell Certified Ethernet 16 bit Card	• 169
Novell NE1000 Ethernet 8 bit Card	• 169
Novell NE2000 Ethernet 16 bit Card	• 199
Western Digital EtherCard Plus 16-bit	• 199
LANtek 16 bit 10base T Ethernet Card	• 199

LANtek 8 bit 10base T Ethernet Card	• 179
LANtek 12 port 10base T Concentrator	• 745
SynOptics 504-st Fiber Optic Transceiver	• 495
3Com 3C503 EtherLink II Card	• 269
Proton Token Ring products	• Call
American Power 520VA (360W) UPS	• 395
American Power UPS Monitor Card/Cable	• 85
Colorado 120MB Tape Backup Drive	• 295
Colorado 250MB Tape Backup Drive	• 345
Colorado 700MB Tape Backup Drive	• 1195
LAN Modem Sharing Software	• 295
LAN 9600 Fax Sharing Hardware & Software	• 895
ARCnet Laptop/Notebook LAN Adapters	• 210
Ethernet Laptop/Notebook LAN Adapters	• 295

TESTED AND APPROVED
NetWare Compatible
Contact the vendor of this product for configurations tested and approved.
123 East 4700 South, Provo, Utah 84606



We're Novell Gold Authorized Dealer all of our computer systems are 100% compatible with Novell SCO XENIX and etc. Our technical staff can help you plan and equip your network system including all necessary hardware and software.

TO ORDER CALL: 1 (800) 462-0436

- **Technical Support/General Information:** (714) 594-9491
- **Fax Order:** (714) 594-6490
- **SALES HOURS:** Mon thru Fri: 8 a.m. to 6 p.m.
- Pricing is subject to change without notice.

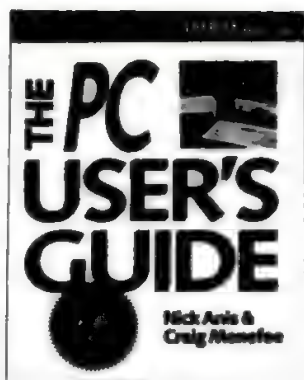
LANtek
Computer, Inc.

661 Brea Canyon Road, Ste #3
Walnut, CA 91789

- **30 Day Money Back Guarantee** (Excluding shipping & software)
- We accept VISA, MasterCard, COD or Purchase Order.
- Corporate, Dealer Accounts Welcome.

All systems are fully compatible with MS-DOS, OS/2, NOVELL, XENIX, and Pick.
All companies and product names are trademarks of their respective companies. Netware are sold in California Only.

CIRCLE 171 ON READER SERVICE CARD



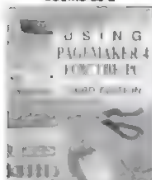
881670-XP \$29.95
Counts as 2



3828 \$29.95
Counts as 2



3720 \$26.95



881629-7P \$26.95
Counts as 2



3679P \$22.95



15063P \$19.95



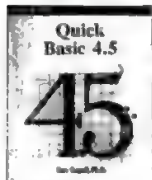
3415P \$21.95



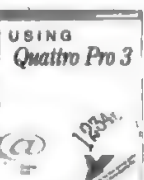
15019P \$21.95
Counts as 2



881711-OP \$19.95



3782P \$22.95



881736-6P \$27.95
Counts as 2



3738 \$26.95



881737-4P \$39.95
Counts as 3



3057P \$15.95



8309P \$28.95
Counts as 2

SELECT 5 BOOKS for only \$4⁹⁵



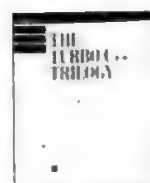
The two most comprehensive computer book clubs have joined forces to bring you the largest selection of business and personal computing references available... at savings up to 50% off publishers' prices!



3270 \$36.95
Counts as 2



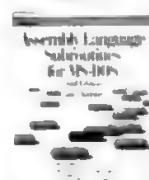
3382P \$29.95



3300P \$24.95



881621-1P \$27.95
Counts as 2



3649P \$24.95
Counts as 2



3678P \$16.95



3089P \$18.95



881690-4P \$19.95



Membership Benefits

The Computer Book Club and the BYTE Book Club have joined forces to bring you the largest selection of business and personal computing titles available today.

- **Big Savings** In addition to this introductory offer, you keep saving substantially with members' prices of up to 50% off the publishers' prices.
- **Bonus Books** Starting immediately, you will be eligible for our Bonus Book Plan, with savings of up to 80% off publishers' prices.
- **Club News Bulletin** 15 times per year you will receive the Book Club News, describing all the current selections—main, alternate, extras—plus bonus offers and special sales, with scores of titles to choose from.
- **Automatic Order.** If you want the Main Selection, do nothing and it will be sent to you automatically. If you prefer another selection, or no book at all, simply indicate your choice on the reply form provided. You will have at least 10 days to decide. We guarantee return postage on books received due to late mail delivery of the News. As a member, you agree to purchase at least 3 books within the next 2 years and may resign at any time thereafter.
- **Ironclad No-Risk Guarantee** If not satisfied with your books, return them within 10 days without obligation!
- **Exceptional Quality** All books are quality publishers' editions especially selected by our Editorial Board.

P1091

All books are hardcover unless number is followed by a "P" for paperback. A shipping/handling charge and sales tax will be added to all orders. (Publishers' Prices Shown)

If card is missing, use this address to join:

©1991 THE COMPUTER BOOK CLUB, Blue Ridge Summit, PA 17294-0820

CIRCLE 311 ON READER SERVICE CARD



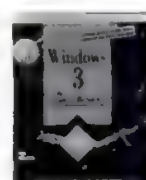
9339 \$29.95
Counts as 2



3617P \$29.95
Counts as 2



3331P \$14.95



881678-3 \$29.95
Counts as 2



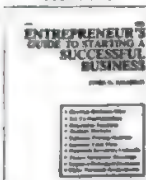
3131 \$27.95



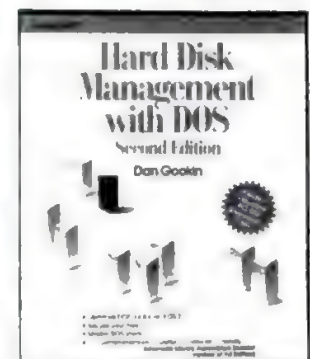
3799P \$24.95
Counts as 2



15064P \$22.95



30049P \$15.95



3490 \$29.95



3683P \$24.95
Counts as 2



2603P \$18.95



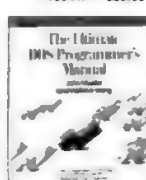
881708-0P \$19.95



10041P \$29.95



15057P \$39.95
Counts as 2



3534P \$27.95
Counts as 2

Paradise

ORDER TOLL FREE: U.S. & Canada - 1 800 348-4PCP (4727)
Japan - 0031-11-1865

In Hawaii (808) 875-1100
Australia - 0014-800-126-943
FAX - 1 (808) 875-0061
Shipping & Technical Assistance - 1 (808) 875-1108

COMPUTERS

IBM PS/2	
L40 SX	4199
PS/2 Mod 35 SX	Call
PS/2 Mod 40 SX 40/80 Mb	2195/2395
PS/2 Mod 50 Z 30/60 Mb	1250/1500
PS/2 Mod 55 SX 40/80 Mb	1995/2100
PS/2 Mod 57 SX 80/160 Mb	2895/3395
PS/2 Mod 65 SX 60/120 Mb	3550/3725
PS/2 Mod 70 A81/A16	4295/4595
PS/2 Mod 80 80/160/320	3275/3625/5075
PS/2 Mod 90/95-486	Call
PS/2 Mod 75	Call
COMPAQ	
LTE 386 SX 30/60	3395/3895
SLT 386 60/120 Mb	4299/4750
DPro 386 S 20 Mod 1/40 Mb	1655/2150
DPro 386 E 40/110 Mb	2750/3033
DPro 386/25 E (All Models)	Call
DPro 386/33 L 120 Mb	4999

TEXAS INSTRUMENTS

Travelmate 2000	1799
Travelmate 3000 20/40/60	Call

AST

Premium Exec Notebook 286 20/40	Call
Premium Exec Notebook 386 20/40/60	Call
Premium II 386 SX/20	1618
Premium II 386/33	2237
Premium II 486 SX/20	2420
Premium II 486/33	3658

TOSHIBA

T1000 SE/XE/LE	799/1299/1395
T1200 XE 20/40 Mb	1653/1795
T2000 SX 40 Mb	2937
T2000 SXE 40/60	3295/3495
T3100 SX 80 Mb	3239
T3200 SX 40/120 Mb	3239/3550
T3200 SX Color	5695
T5200 40/100/200/Color	4488/4199/4688/5924

DFI

286-12 Mhz	539
386-16 Mhz	839
386 SX-20 Mhz	965
386-25 Mhz	1215
386-33 Mhz	1590
486-25 Mhz	3039

1-year on-site warranty
Call for Custom Configurations

PANASONIC

170/270	1439/1939
---------	-----------

MONITORS & TERMINALS

MONO/COLOR	
IBM 8503/8512	227/459
Samsung RGB	200
Amber 12" TTL	85
VGA/EGA MONITORS	
IBM 8506/07/08	899/629/928
IBM 8513/14/15	525/1150/699
Magnavox VGA	259
Mitsubishi EGA	329
Mitsubishi 1381/HL6935	485/1900
NEC 2A/3DS	460/569

NEC 4DS/5D	989/2265
Packard Bell 8529/8541/8510	275/290/339
Panasonic 1381/1391	369/459
Samsung VGA/4581/4592	344/430/309
Sony CPD 1304	639
Zenith 1492	595

VIDEO BOARDS

ATI Graphics Ultra	575
ATI VGA Wonder 256/512+	199/240
EGA 640 x 480	89
Hercules GB 1024/1024+2	532/895
NEC Graphics Engine	895
Orchid ProDesigner II 512/1 Mb	239/299
Paradise VGA+/16	122/145
Paradise VGA 1024 256/512	159/199
Herc Mono/w Parallel Card	45
VGA 1024 256/512	109/139

PRINTERS

CANON	
BJ 10E	309
BJ 300/330	Call
CITIZEN	
GSX 130/140+/145	259/299/399
HSP 500/550	301/421
DICONIX 150	343/347
P/S	
EPSON	
LX 810	173
FX 850	289
FX 1050	399
LQ 570	265
LQ 870	445
LQ 860	549
HEWLETT-PACKARD	
LaserJet 3/3D	1549/2499
LaserJet 351	3750
LaserJet 2P/3P	839/1049
DeskJet 500	489
ScanJet +	680
PaintJet/XL	955/1680
FONTS & MEMORY	
Pacific Data 25-1	259
Pacific Data 1/2/4 Mb	129/159/265
Pacific Connect Laser Share	299
Pacific Page PE/XL	349/721
Pacific Data Plotter in a Cag	239
LaserJet Memory 1/2/4 Mb	119/149/245
Compaq 1/4 Mb Modules	118/383
IBM/Toshiba Memory	Call
CPI Jet Page/Superset 425+	299/259
IBM	
4019 E/4019 Laser	995/1495
Personal Printer II	Call
ProPrinter 24P	365
ExecJet	780
NEC	
P-3200 3300	276/Call
6200/6300	476/645
Silent Writer 290/990	2450/2895
Silent Writer 2 Mod 90	1559
OKIDATA	
ML 182	228
ML 320/321	324/451

Quality at the best prices under the sun.



Specializing in International Orders

ML 380	289
ML 390+/391+	449/613
ML 393+/393+ color	968/1055
Okilaser 400/800	639/965
Okilaser 820/840	1276/1949
PANASONIC	
1123/1180	214/147
1124/1624	289/349
1654/1695/2624	548/364/479
4420/4450/4455	799/1129/1883

TERMINALS

Wyse 50/60	375/300
Wyse 30/85	310/339
Wyse 150/185	289/379

SOFTWARE

Aldus Pagemaker 4.0	495
Ashton Tate dBase III+/IV	419/479
Borland Quattro Pro 2.0	295
Carbon Copy 6.0	110
Clarion Prof. Developer	450
Compaq IBM DOS	Call
Harvard Graphics 3.0	370
IBM Displaywrite 5.0	249
Lotus 1-2-3 2.3/3.1	329/399
Microsoft All Titles-Lowest Price	
Microsoft Windows 3.0	93
Norton Adv. Util 6.0	114
Procomm Plus	62
Quicken 4.0	39
Ventura Publisher V 3.0	479
WordPerfect 5.1	245

400 Additional Titles In Stock

PLOTTERS AND DIGITIZERS

HEWLETT-PACKARD	
7475A	1349
7570A/7575A	2699/3500
7576 EXL	4450
SUMMAGRAPHICS	
Summasketch 2 12X12/12X18	335/565
CALCOMP	
Pacesetter 2000	3150/3995
12X12/12X18	298/597

MULTIFUNCTION BOARDS/CARDS/CHIPS

IBM 5250 Emulation	695
AST 5251 Emulation	499
AST 6-Pack w/384 k	145
Intel AboveBoard Plus w/512 k	289
Intel InBoard 386 PC	492
Cyrix Fasmath	Call
80287-XL	99
80387-SX/16/20/25/33	Call

MODEMS & COMMUNICATIONS

ATI 9600 ETC	399
CPI 2400 Internal	69
CPI 2400 Ext Fax	123
CPI 2400 Ext MNP	154
CPI 9600 Ext	439
Everex 2400/2400 MNP	99/164
Hayes 2400/2400B	319/218
Hayes Ultra 96	639

Practical Pocket Modem	99
Intel 2400/9600	217/499
MegaHertz Laptop Modems	Call
Practical Perif. 2400/9600	132/479
US Robotics HST/Dual	585/799

FAX MACHINES

Sharp FO 216/240/334	559/699/795
Intel Satisfaction	385
JT Fax 9600 B	339
CPI 2496 IF	173

MICE

DFI 200/400	32/42
Logitech C9/Bus/PS2	82
Logitech Mouseman	72
Logitech Scanman/PC/PS2	169/240
Microsoft Mice/+ Windows 3.0	103/145
Microsoft Ballpoint	129

DRIVES & TAPES

Colorado DJ10	239
Conner 40/100	299/499
ST 225/238	189/192
ST 157A/251-1	229/239
ST 1126A/1144A/1239A	449/630/795
ST 4096/4182E	530/925
Plus II XL50/105	388/578
Mountain	Call
Panasonic LF5010 Worm	2215
Procom Ext 5.25 PS/2	199
Procom PS2 Hard Drives 120/200 Mb	Call
Procom Laptop Floppy	Call

NETWORK

ARTISOFT

Lantastic 2 Mb Starter Kit	338
Lantastic 2 Mb Adapter	139
Lantastic 10 Mb Starter Kit	469
Lantastic 10 Mb Adapter	199

NETWARE

Netware 2.2 5-User	499
Netware 2.2 10-User	1159
Netware 3.11 20-User	2049
Netware 3.11 100-User	4045
NE 1000/NE 2000	159/189
NE/2 NE 3200 (EISA)	249/749

SMC

Arctnet PC 130 8 Bit	99
Arctnet PC 500 16 Bit	289
Arctnet PC 500 ws 16 Bit	179

MISC & ACCESSORIES

Keytronics KB101+	89
Rensington Masterpiece/Plus	85/95
AB Switch Box	27
TrippLite 450/1200/2000	296/618/1175
+ outlet surge	39

**Win
A Free
Hawaii Vacation!**

No purchase necessary

Most orders shipped insured next or second day air. **FEDERAL EXPRESS** / 24-hour worldwide order tracking / Printer Orders received by 9 PM CST can be shipped same day / All credit card and COD orders checked electronically / We accept Amex, Visa, MC, JCB, Discover, Diners Club, COD's, Wire Transfer, Letter of Credit, **TERMS & LEASE AVAILABLE** (one day approval) / Credit cards not charged until product shipped **GOVERNMENT AND EDUCATIONAL P.O.'S ARE WELCOME**. Allow 10 days for personal checks to clear / Prices reflect a 3 per cent cash discount / Non-defective returns subject to a restocking charge / All warranties good through Paradise Computer Products / Prices subject to change without notice.

HOURS: 8:30 AM TO 8:30 PM CST MON-FRI, 10 AM TO 4 PM CST, SAT.
Paradise Computer Products Ltd. P.O. Box 890553 Dallas, TX 75389-0553

CIRCLE 145 ON READER SERVICE CARD



It's Not The First Word On DOS 5. It's The Last.



"No other source gives you Proise's powerful utility programs, presented with a programmer's understanding of the underlying principles, an engineer's insistence on precision, and a teacher's love of accurate, concise communication."

Foreword
BILL MACHRONE

Suggested retail price
is only \$39.95.

ISBN 1-56276-007-6

Jeff Proise, nationally recognized DOS expert and author of *PC Magazine's* "Tutor" column, writes about DOS 5 in a way no one else can. He has spent countless hours perfecting essential techniques and utilities, and in this book he shares them with serious DOS 5 users.

Jeff Proise answers the questions the manual leaves unanswered. He also picks up where DOS 5 leaves off with 50 all-new DOS 5 utilities on disk. You'll find productivity-boosting programs that will dial your phone, search an entire disk for files, expand printer capabilities, compile batch files, and much more. No other DOS 5 guide comes close.

Look for these Ziff-Davis Press books at the following booksellers:

B. Dalton
BOOKSELLER



Barnes & Noble
BOOKSELLERS Since 1873



Doubleday Book Shops

SCRIBNER'S
BOOKSTORES



© 1991 Ziff-Davis Press, 5903 Christie Avenue, Emeryville, CA 94608

CIRCLE 387 ON READER SERVICE CARD

Micronics 486/33 EISA

\$1999



Exquisite engineering, unparalleled performance, exceptional reliability.

Micronics system boards offer the best options for your new or upgraded PC products. Proprietary designs, in-house FCC certification and compatibility testing coupled with Micronics sub-1% field failure rates make "Micronics" THE brand to specify.

386SX

20Mhz, 0MB, non-cache, ISA, Baby AT size.

386DX

25Mhz, 0MB, ISA, Baby AT size, ASIC design.

386DX

33Mhz, 0MB, 64KB direct mapped cache standard, up to 32MB RAM on board, ISA, Baby

AT size, Gemini Chipset design.

486DX

25Mhz, 0MB, 64KB direct mapped cache standard, up to 16MB RAM on board, ISA, full size, TTL design motherboard

486DX

33Mhz, 0MB, 64KB direct mapped cache standard, up to 64MB RAM on board, ISA, Baby AT, Gemini ASIC Chipset design.

486DX EISA

33Mhz, 0MB, 64KB direct mapped cache standard, up to 64MB RAM on board, EISA, full size, TTL design motherboard.

MPORT 325

AC Portable, 80386DX-25Mhz, 40MB hard disk, 32K cache memory, 640x480 Mono VGA.

Prices and specifications Subject to change without notice.

386sx 20\$299
386DX 25 ISA499
386DX 33 ISA779
486DX 25 ISA...1299
486DX 33 ISA...1499
486DX 33 EISA .1999
MPORT 3252999

- 1 yr limited mfg's war.
- 30 day money-back guar.
- Toll-free technical support
- 30 day performance guar.
- FEDEX shipping available
- VISA, MC, Disc., acc. PO's

1-800 235-8935



TECHNOLOGIES

M-F 8:30AM-7PM CT.
SAT 10AM-4PM CT

INTERNATIONAL: 1-816 478-8300
FAX: 1-816 478-4596 (24 HRS)

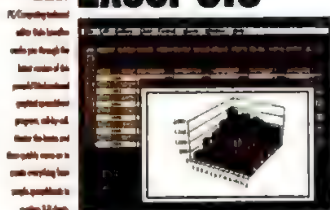
TOLL FREE UK: 0800-897-545
TOLL FREE AUSTRALIA:
0014-800-125-875

2900 S. 291 Hwy., Indep., MO 64057

BookNet



PC Computing Guide to Excel 3.0



by Gail Laverne

Take a step-by-step tour of this powerful, Windows-based graphical spreadsheet program. Filled with inside tips and shortcuts, this guide reaches by example, with dozens of clear, well-illustrated exercises to help you with everything from simple spreadsheets to exciting 3-D charts.

PC MAGAZINE Guide to Notebook & Laptop Computers

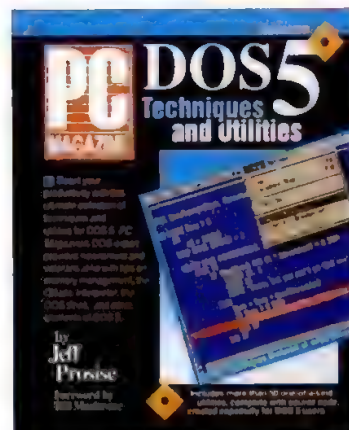
Award-winning PC Magazine Executive Editor, Bill Howard, makes you an expert on choosing and using notebook and laptop computers! Includes unique utility programs on disk that enhance productivity and address limitations of notebook and laptop computers.

by
Bill
Howard



PC Magazine executive editor Bill Howard has written the definitive guide to choosing and using notebook and laptop computers. Packed with helpful advice on all aspects of laptop use, plus software tips.

◆ Includes one 3 1/2" disk with utilities that enhance productivity and address the limitations of laptops.



Jeff Prosize, the nationally recognized DOS expert and author of PC Magazine's "Tutor" column, takes you far beyond the manual to help you achieve peak performance with DOS 5. This comprehensive book offers everything from configuring your system to constructing batch files.

◆ Includes two 5 1/4" disks with one-of-a-kind DOS 5 utilities, including programs that dial your phone, search disks for files, and more.



BookNet Order Form

Name _____

Address _____

City _____ State _____

Zip _____ Telephone (____) _____

Payment By: ☐ Visa ☐ Master Card ☐ American Express

☐ Check/Money Order (payable to Ziff-Davis Press)

Card # _____ Exp. Date _____

Signature _____

Quantity	Title	Price Ea.	Total
	PC/Computing Guide to Excel 3.0 (1-56276-019-X)	\$24.95	
	PC Magazine Guide to Notebook and Laptop Computers (1-56276-005-X)	\$29.95	
	PC Magazine DOS 5 Techniques and Utilities (1-56276-007-6)	\$39.95	
	BASIC Techniques and Utilities (1-56276-008-4)	\$29.95	
	PC Magazine Guide to Using NetWare (1-56276-022-X)	\$39.95	

Sub Total \$

Shipping and handling inside the U.S. \$3.00 per book

Overseas airmail for foreign orders \$15.00

Sales tax for California residents 8.25%

Total \$

Prices subject to change without notice.

3002

1-800-688-0448

PC MAGAZINE Guide to Using NetWare

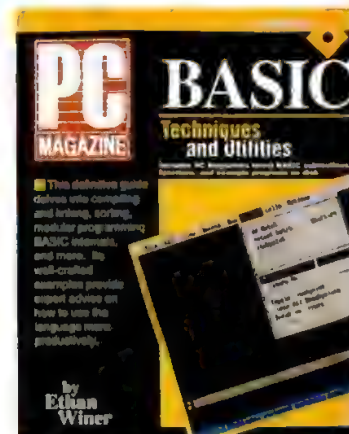
The essential survival guide to NetWare, with tips, tricks, and techniques you won't find anywhere else. Practical, real-world solutions from NetWare expert Les Freed and PC Magazine's workgroup systems editor, Frank J. Derfler, Jr.

by
Les Freed and
Frank J.
Derfler, Jr.



Here are the insider tips, tricks, and techniques for NetWare you can't find anywhere else. NetWare expert, Les Freed, and PC Magazine's workgroup systems editor, Frank Derfler, combine years of experience to give you effective, real-world solutions.

◆ Includes one 5 1/4" disk with specially designed NetWare utilities, MENU scripts, and batch files.



Now you can create more productive, efficient programs using BASIC. This book, filled with insider tips—known only to BASIC programming gurus—will take you into the heart of the BASIC language and explore innermost details not found anywhere else.

◆ Includes one 5 1/4" disk with numerous BASIC and assembler subroutines, functions, and examples.

How to order Ziff-Davis Press books:

Mail order form to Ziff-Davis Press BookNet 5903 Christie Ave. Emeryville, CA 94608.

Fax order form to Ziff-Davis Press BookNet at (415) 601-2099. Credit card orders only.

Call toll-free 1-800-688-0448 and have your VISA, MasterCard, or American Express card ready. In Canada, call 1-800-263-4374.

Ziff-Net Online Services command line: GO ZD BOOKS. Credit card orders only.

CIRCLE 494 ON READER SERVICE CARD

by
Joe Salemi

Advisor

Help for Readers Making Personal Computer Decisions

RPG COMPILERS ON A PC

We are two young programmers who work on an IBM AS/400. Now we want to use RPG III on a PC. Are there any RPG III compilers for MS-DOS systems?

Michael Gruber and
Oliver Bichler
Vienna, Austria



There are no RPG III compilers out for DOS systems at the time of this writing. However, there are two companies with RPG II compilers.

Software West Inc.'s (Orange, Calif.; 714-542-5202; \$895) RPG II compiler requires DOS 3.0 or later, and a minimum of 256K RAM. It includes a full-screen editor and a sort/merge utility, and can allocate and manipulate RPG data files. Software West has an RPG III compiler under development; it's due to be released in the fourth quarter of 1991.

Lattice Inc. (Lombard, Ill. 60148; 800-444-4309, 708-916-1600; \$1,600) also sells an RPG II compiler. It requires 512K RAM and DOS 3.1 or later; a hard disk is recommended. Lattice's compiler includes a number of utilities such as a screen design aid, sort/merge, an operations control language processor, and a data file utility. Lattice is also developing an AS/400-compatible version, called RPG/400, but the release date has not yet been announced.

MATCHING A SCSI CONTROLLER WITH A NEW DISK DRIVE

I have a 386SX machine with an 80MB SCSI hard disk. The SCSI controller is an Adaptec AHA-1542A card and includes an external SCSI connector. I believe that CD-ROM drives are generally connected to PCs via a SCSI interface, and the SCSI control-

- **RPG COMPILERS ON A PC:** Are there any for MS-DOS systems?
- **MATCHING A SCSI CONTROLLER WITH A NEW DISK DRIVE:** Can a CD-ROM be added to an existing SCSI controller?
- **IS THE 486 REALLY SUPERIOR TO THE 386?** Is the on-board math coprocessor the only reason the 486 is faster?
- **IN SEARCH OF THE ZERO DOT-PITCH DISPLAY:** Are there any 16-inch monochrome Super VGA monitors?
- **LEADING EDGE SUPPORT:** Where is Leading Edge Products these days?
- **DOES NORTON UNDELETE WORK IN OS/2 1.3?:** How to recover erased files when you're running the high-performance file system (HPFS) in OS/2 1.3.

ler is generally purchased with the drive.

If I purchase a CD-ROM drive, will I be able to use my existing SCSI controller? If I need to add a second controller, will it conflict with my existing one?

Grant McLean
Wellington, New Zealand



While the theory behind SCSI (small computer system interface) peripherals is that they should be interchangeable, in practice you'll find that SCSI devices are picky about which controllers they'll work with. You should look for a CD-ROM drive that specifically supports your Adaptec controller.

If you can't find one that works with the Adaptec, you can usually add a second SCSI controller to the system, provided you have address space in the high memory area for the on-board ROMs. There are jumpers on the card that set the memory ad-

dresses for the ROM; just make sure you set the address so it doesn't conflict with any other peripherals already in the system.

The down side of adding a second SCSI card is its use of additional memory above the 640K DOS area. If you use a 386 memory manager, or the LOAD-HIGH capabilities of DOS 5.0, you'll find you have less free high memory to load TSRs. In addition, CD-ROM drives come with memory-resident drivers that let your system talk to the drive and which generally load into DOS memory (unless you use a memory manager to load them high), so the loss of the additional high memory could have a major impact on the amount of free RAM you'll have after adding the drive.

IS THE 486 REALLY SUPERIOR TO THE 386?

I am confused by your February 12, 1991, cover story on 33-MHz 486 machines. You state that

"Overall, these 33-MHz 486s offer a raw performance increase of about 33 percent over 33-MHz 386s," yet in the same article you state that "in almost every way, the 486 is simply a 386 with some external functions—notably math coprocessing—moved onto the same slice of silicon as the CPU."

Is the performance improvement then due almost entirely to the addition of the coprocessor? The article does not seem to make this clear.

The article on coprocessors in the same issue suggests that for most applications, the coprocessor is not really needed. Does this mean then that the 33 percent power increase for the 486 is illusory for OCR work on my processor-upgradable 386/33?

Frank Billington
Lethbridge, Alberta, Canada



You're not alone; many people find this issue confusing.

The addition of the math coprocessor into the 486 only helps those applications that are designed to use a math coprocessor, such as statistical, math, and CAD/CAM programs. It's of little use to programs that don't do a lot of number crunching.

The speed and power increase of the 486 over the 386 isn't illusory though; it exists because of the design of the chip. The CPU is the heart of a computer, but it doesn't work alone; there are many support chips that are needed to assist it in doing its job.

The 486 contains the equivalent of over 1 million transistors (more than 4 times the number contained in the 386); many of these extra circuits are replacements for the circuits that are in external support chips in 386 systems. By moving these circuits into the CPU itself, the data path is considerably shortened, and the communication between the

Advisor

CPU and the support circuits are much quicker.

Another factor is the improvement in the microcode on the chip itself. This is the internal set of instructions that tell the CPU how to function; application programs actually pass their requests for computation services to the microcode. When Intel designed the 486, it also took the opportunity to optimize the 386's microcode. Thus, instructions that may take many clock cycles to perform on a 386 are completed faster on the 486.

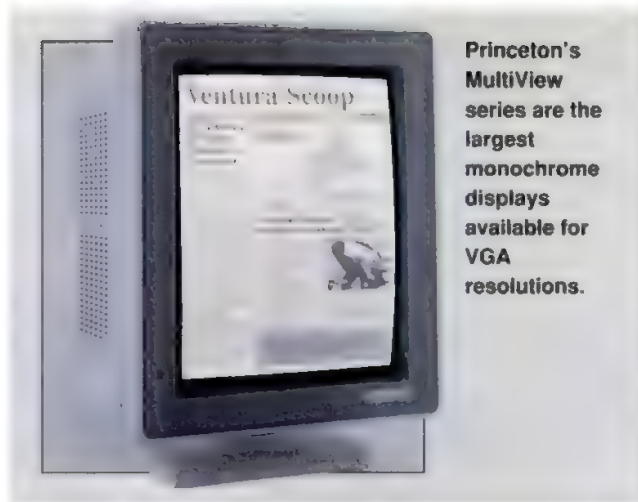
A third factor that boosts the power of the 486 is the 8K "prefetch cache" built into the chip itself. This cache is a buffer area that's used to store the next 8K of program instructions, and/or data from the disk or memory.

While the main CPU circuits are carrying out the processing requested by the application, other support circuits on the chip are moving the next set of program instructions or data to the cache. Most of the time, the code or data is processed sequentially, so the odds are that the instructions or data the CPU wants next will already be waiting in the prefetch cache. This means that the CPU can keep right on processing, without having to pause and wait for the rest of the system to catch up to it. Many 386 systems have caches in separate chips on the system board, but once again, there's a significant advantage to reducing the physical distance that the circuits must cover.

Finally, the 486 is able to execute one instruction per clock cycle. In the 386, two cycles are required for each instruction.

The combination of all three factors gives the 486 its performance boost over a 386 running at the same clock speed. Especially those that are written in 32-bit instructions, since the greatest benefit from all of these improvements pays off more with 32-bit software than the 16-bit software that's most common in the DOS environment.

The only 32-bit OCR software we're aware of is Caere's *OmniPage*. None of the OCR programs we know about use the floating-



Princeton's MultiView series are the largest monochrome displays available for VGA resolutions.

point instructions that would benefit from the 486's math coprocessing unit.

IN SEARCH OF THE ZERO DOT-PITCH DISPLAY

I was delighted to see on the cover of the March 26, 1991, issue that you were reviewing 16- and 17-inch monitors. But when I read the article I found that all ten of the monitors you reviewed had 0.26-mm. dot pitch or worse.

I won't settle for anything less than 0.00-mm. dot pitch! I want the display to be as crisp and clear as possible. That means monochrome.

My computers display text, not CAD drawings, so I don't want to pay \$1,000 for grainy pictures, convergence problems, X rays, and all the other headaches from color monitors. Are there no 16- or 17-inch monochrome Super VGA monitors?

Dave Burton
Cary, North Carolina



There really is no such thing as 0.00-mm. dot pitch. Even on monochrome monitors, the characters are made up of dots, though the pitch is much smaller than on a color monitor.

On the amber or green monochrome monitors, the sharpness of the characters is caused by a combination of the smaller pitch and the persistence of the image on the phosphors. Amber and green monochrome monitors can be used with MDA, CGA, and EGA adapters, so the actual resolution of the characters is determined by the type of graphics card

in the system.

However, the VGA and Super VGA standards are analog, not digital, so the old monochrome monitors won't work with them. For these systems, monochrome monitors are black and white, with the colors translated to 64 shades of gray. Because the character image only requires one pixel per dot (instead of the three RGB pixels used by color systems), monochrome VGA screens have sharper text than the equivalent color screens. Some vendors even include the option to switch the white characters to green or amber, so fans of the old monochrome displays can stay with their preferred color.

The largest monochrome VGA displays currently available are 15 inches on the diagonal. Princeton Publishing Labs (Skillman, N.J.; 609-924-1153) has two 15-inch models; the MultiView (\$455) and MultiView/2 (\$555) are multiscan-type displays that support resolutions up to 1,024 by 768. The MultiView has a standard screen, while the MultiView/2 is a flat-screen model.

DOES NORTON UNDELETE WORK IN OS/2.1.3?

I've recently installed OS/2 1.3 on my 386 system, and I'm thinking of formatting part of my hard disk with HPFS. I have one concern, though; I've not heard of any Norton-like utilities for undeleting erased files on an HPFS partition. Does anyone make such a thing?

Brad Hayford
West Springfield, Virginia



The major DOS utility vendors have not yet gotten around to releasing OS/2 versions of their undelete utilities, although Symantec Corp. has published *The Norton Desktop for Windows*, which has an unerase program for use with the Windows environment.

People running OS/2 and HPFS (High Performance File System) aren't out of luck, though—*GammaTech HPFS Utilities* (GammaTech, P.O. Box 70, Edmond, OK 73083-0070; 405-359-1219; \$99) includes two versions of an undelete utility that will (in most cases) recover files on an OS/2 HPFS partition. The command line version undeletes a single file at a time; the Presentation Manager version let's you chose one or more deleted files to restore.

The package also includes a disk defragger, a utility that uses the Extended Attributes to add comments to files, and one that lets you find lost or duplicate files anywhere on the HPFS volume. *HPFS Utilities* runs either full-screen or in an OS/2 window, and is available directly from GammaTech.

LEADING EDGE SUPPORT

I use a Leading Edge Model D computer. I never see anything mentioned about them any more. Is the company still in business? If so, how do I contact them?

Janet Hager
Hewett, West Virginia



The original manufacturer of Leading Edge computers went bankrupt about two years ago. Since then, the Daewoo Corp. has purchased the company from the original owners, and made it a subsidiary. For further information, you can contact Leading Edge Products at 117 Flanders Rd., Westboro, MA 01581; 508-836-4800.

ASK THE ADVISOR

Send your question to PC Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload it to PC MagNet (see the instructions for joining on page 10 of this issue). Sorry, but we cannot send personal replies. ■

PREMIER

The color showcase that puts the spotlight on leading-edge PC products and services.

462-470

CLASSIFIED

Flexible-format display advertising: computer systems, components, software and more.

471-481

BUSINESSCARD

A forum for innovative, hard-to-find and low cost PC hardware, software and services.

482-488

**PC MAGAZINE
MARKETPLACE**

One Park Avenue, 3rd fl.,
New York, NY 10016 • For
information on advertising in
PREMIER, CLASSIFIED or
BUSINESSCARD, contact
your account representative
or call 1-212-503-5115 or
800-825-4237.

PRODUCT CATEGORIES

HARDWARE

Add-In-Boards	462	471	482
CD-ROM		471	482
Communications	462		482
Computer Systems	463	471	482
Connectivity			
Disk Drives	465		
Diskettes		473	
Expansion Units	465	473	
Input Devices	465		
Monitors			
Peripherals	465		482
Peripheral Sharing Devices			
Power Supplies			
Printers		473	482
Rentals			
Security			482
Tape Drive Subsystems	466	475	

PREMIER

CLASSIFIED

BUSINESSCARD

SOFTWARE

Accounting	475	482	
Backup Systems	466		
Business		482	
Business Time Management		482	
CAD/CAM	467		483
Communications	467	475	
Computer Languages			483
Construction			483
Data Base	467		483
Data Entry	467	475	
Desktop Publishing	467		483
Diagnostic			
Education	476	483	
Engineering	476		
Entertainment/Games	468	476	483
Financial	468	476	483
Flow Chart	469		483
Foreign Languages		477	
General			483
Graphics	469	477	483
Health			484

PREMIER

CLASSIFIED

BUSINESSCARD

MISCELLANEOUS

Inventory		484	
Mailing Programs		477	
Manufacturing			
Mapping		484	
Medical		484	
Multi-User Systems			
Music		477	
Preventive Maintenance		477	484
Programmers Tools	469	477	484
Project Management			
Public Domain/Shareware		477	
Real Estate		484	
Religion	470	478	484
Sales Marketing			484
Scientific			487
Security		478	
Statistics		478	487
Surveys			487
Taxes		478	
Utilities	470	478	487
Windows			487
Word Processing			

PREMIER

CLASSIFIED

BUSINESSCARD

PREMIER

CLASSIFIED

BUSINESSCARD

Professional Video Quality Without Compromises



If you think your PC can't produce video that meets broadcast standards, you haven't seen VGA Producer PRO!

VGA
PRODUCER
PRO

MAGNI

Magni Systems, Inc.
9500 SW Gemini Drive
Beaverton, OR 97005 USA
(800) 624-6465 (MAGNI-OK)
(503) 626-8400
FAX (503) 626-6225
BBS (503) 641-1859

See it at COMDEX Fall '91
Booth #S0894.

Magni is a registered trademark of Magni Systems, Inc.
Magni and VGA Producer PRO are trademarks of
Magni Systems, Inc.

CIRCLE 901 ON READER SERVICE CARD



Affordable!
Voice Mail
Any Time! Any Place!
Keeps You in Business
24 Hours-A-Day.

The finest in Multi-line PC based:

- ◆ VOICE MAIL
- ◆ CALL PROCESSING
- ◆ TELEMARKETING
- ◆ SALES AND ORDER PROCESSING

Voice Solution transforms your computer (PC, XT, AT, 286, 386, or 486) into a MULTI-LINE voice processing command center. Intelligently process your sales and messages.

Running in the background, Voice Solution provides excellence in voice mail, while giving you the freedom to do other tasks on your computer. Package includes: Hardware, Software, Manual, Speaker and Two Year Warranty.

Voice Solution.....\$995

(Complete Hardware & Software)

DEVELOPER/OEM PACKAGES
VISA • MC • AMEX • COD

1-800-688-TALK

(688-8255)

FAX (415) 522-5556

1125 ATLANTIC AVE.
ALAMEDA, CA 94501
TALKING TECHNOLOGY, INC.



CIRCLE 902 ON READER SERVICE CARD

386 POWER! 286 to 386 upgrade-\$199

Affordable! Slotless! The Evergreen 386 SuperChip II is a replacement chip that converts your 286 IBM, Compaq, or AT compatible to a 386SX. Run all your present software and hardware plus Windows 3.0 in the enhanced 386 mode and you can utilize DOS 5.0's Loadhigh and Devicehigh programs or other memory management software. Speed up your processor (increase on an AST Premium 286 using Norton SI version 4.5 goes from 11.2 to 15.6!) Math accelerator board available for your 287 Math Coprocessor.

800 733-0934

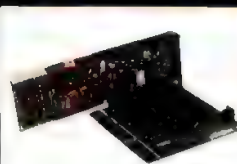
Evergreen Technologies

1325 NW Ninth St.
Corvallis, OR 97330-4508
503 757-0934 FAX 503 757-7350

CIRCLE 903 ON READER SERVICE CARD

Is Your Computer A WIMP?

IBM PC/XT/AT 2870
Compaq AT&T 6800

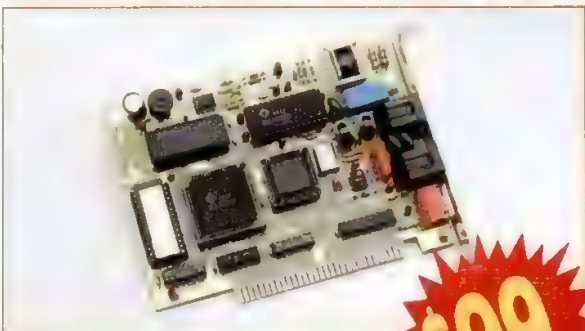


Direct Replacement
Motherboard
Compatible with existing
Hardware and Software

No Need To Buy New System.
We Have The Solution For You!
ALPHA SYSTEMS LAB, INC.
Call For Details: 714/830-8838
Fax: 714/887-9473
Design & Manufacture
FREE INSTALLATION
2 Years Warranty, Made In USA
286-12MHZ, 1MB only \$250.00
Available Now 386DX, 486DX
and 486SX-25/33MHZ
OEMs Welcome

CIRCLE 904 ON READER SERVICE CARD

The Ultimate 96/24i Send/Receive Fax Modem



- Compatible with all Group III Fax Machine
- Auto receive, print and save incoming fax
- Time scheduled transmission
- Fax mail merge
- Directly fax any Word, Multimate, Wordstar or Word Perfect file
- Powerful BitFax and BitCom Software

96/24p PLUS MNP Send/Receive Pocket Fax/Modem	\$219	All Fax/Modem come with BitFax/BitCom Software
96/24 MNP Internal Send/Receive Fax/Modem	\$129	
4800/2400 Internal Send only Fax/Modem	\$69	
2400 bps Internal Modem	\$49	
2400 bps Pocket Modem	\$109	

No surcharge for VISA/MC, 30-days money-back guarantee. P.O. with credit approval. Dealers welcome. Hours (P.T.): 8:00 am to 6:00 pm Monday-Friday

(415) 490-2233 ComPower Inc.
4650 Fremont Blvd., Suite 115, Fremont, CA 94538 Fax: 415-490-5607

CIRCLE 906 ON READER SERVICE CARD

PC-EXPANDER

by cybex



Connect up to 8 Keyboards and Monitors to a Single PC

- PC, XT, AT and 100% IBM Compatibles
- MDA, CGA and EGA Video
- Only 1 Keyboard may be active at a time
- Selectable Takeover Delay up to 10 seconds
- Single output cable for each Keyboard/Video Channel
- Internal/External power selectable

Cybex Corporation

2800-H Bob Wallace Ave • Huntsville, AL 35805
(205) 534-0011 • FAX (205) 534-0010

CIRCLE 906 ON READER SERVICE CARD



Computer Connection

To order: 1-800-838-2714
Questions: 1-503-593-6619
2 Venture Lane, P.O. Box 3629, Sunriver, OR 97707

Create your own system!

Buy only what you need or upgrade your present system

486 33 MHz 64K cache \$1099	486 25 MHz 64K cache \$1069	386 40 MHz 64K cache \$829	386 33 MHz 64K cache \$589
386 25 MHz 64K cache \$539	386 25 Megahertz \$459	386SX 16 Megahertz \$379	286 16 Megahertz \$199

Includes desktop case and power supply. Choose options below.

KEYBOARDS

101 Key Enhanced \$49.95

HARD DRIVES

40MB 28ms \$169.95
80MB 17ms 289.95
120MB 18ms 389.95
213MB 15ms 619.95

FLOPPY DISKS

1.2 MB 5.25 inch \$69.95

1.44 MB 3.5 inch 69.95

DISK CONTROLS

IDE Floppy and Hard

Disk Controller \$19.95

MONITORS

V.G.A. Color 14" 640x480

256K card .39 dot pitch

\$329.95

Super V.G.A. Color 14"

1024 x 768 1MB card

.28 dot pitch \$409.95

Monochrome 14" Amber

with card \$129.95

SERVICE

12 month on site \$39.95

MEMORY

1 MB RAM \$ 69.95

4 MB RAM 239.95

256K Cache upgrade 139.95

I/O CARDS

2 Serial port, 1 Parallel port,

upgrade \$19.95

MODEMS

Internal 2400 Baud \$64.95

External 2400 Baud 89.95

D.O.S.

Version 3.30 \$55.95

Version 4.01 55.95

Version 5.0 64.95

All systems are 100% IBM, Novell and Windows compatible. They are fully assembled and tested. Motherboards are available separately. Tower case available. Math Co-Processor available. Power supply is 200W for desktop and 230W for lower cases. All systems ISA Bus. 486/33 Cache available in EISA bus. FCC approved. MasterCard, Visa card and Discover card and C.O.D. orders accepted.

Prices subject to change • Shipping & Handling Additional

CIRCLE 909 ON READER SERVICE CARD

ALL IN ONE: ONLY \$595

FAX SCANNER PRINTER COPIER



SEND, RECEIVE, SCAN, PRINT, SCHEDULE FILES FROM / TO PC.
WORK UNDER DOS & WINDOWS ALSO WORKS
AS STAND-ALONE FAX

COMPEX Int'l. Inc.
312 Broadway
Cambridge, MA 02139

1-800-626-8112
(617) 354-5045
FAX (617) 864-9516

Visa, MasterCard, American Express

CIRCLE 907 ON READER SERVICE CARD

NETWORKING

SOLID LAN 1-800-422-2966

- Complete Network Solution including software
- Plug and play setup. No programming
- Ethernet or Token Ring (10 & 16)
- Non-proprietary & 100% IBM Standard
- External pump power 2.5W by money-back guarantee.

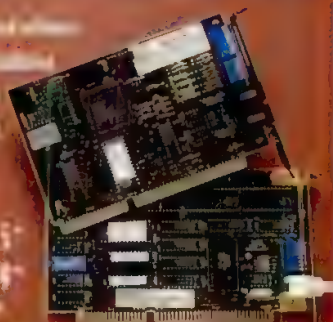
10 Mbps LAN \$215

10 Mbps LAN \$365

*List price. Price subject to change.

SOLID Technologies 300 S. ...

(214) 745-0636



CIRCLE 908 ON READER SERVICE CARD

RECENT AWARDS

BLACKSHIP

486/386

SVGA SYSTEMS

ONSITE SERVICE

GE Computer Service

Standard Features

- 30-Day Guarantee
- Unlimited Toll-Free Technical Support
- 1 Year GE On-Site Service in Most Locations
- Custom Configurations



BLACKSHIP
COMPUTER SYSTEMS, INC.

Call Blackship for all your System and Networking needs.

We have a complete line-up of 286, 386, 486SX, 486, laptops, and notebooks.

4031 Clipper Court • Fremont, CA 94538

Tel: 415-770-9300, Fax: 415-770-8674

Toll-Free Orders

1-800-877-6249

CIRCLE 910 ON READER SERVICE CARD



Ariel Design, Inc.

COMPUTER SOLUTIONS



UPGRADE!
to AMI
386/486
Cache

MOTHERBOARDS & SYSTEMS

- NEW!** AMI 386SX-20 25 32Kb Cache, integrated I/O
- AMI MARK III 386-25 64Kb Cache, upgradeable-486
- NEW!** AMI MARK IV 386-33 40 Screamer 64/256Kb write back Cache
- AMI MARK IV 486-33 Screamer 64/256Kb write back Cache
- NEW!** AMI Baby Voyager 486-33 64/256Kb write back Cache, integrated I/O
- NEW!** AMI EZ-Flex EISA 386-33 64/256Kb write back Cache, integrated I/O
- NEW!** AMI EZ-Flex EISA 486SX-20, integrated I/O
- NEW!** AMI EZ-Flex EISA 486-25, 33 64/128/256/512Kb wb Cache integ. I/O
- AMI 486-33 Enterprise II 128Kb Cache, 1-FDC
- AMI EISA/SCSI Host adaptor 80386SX-16 processor, 1/4/16MB Cache

Motherboards from the industry leader. 1 Year Limited Warranty.
Toll Free Tech support. Call for the best price. AMIDIAG \$78

45 Pond Street • Norwell • MA 02061
1-617-982-8800 • Fax: 1-617-982-9095

1-800-55Ariel

CIRCLE 911 ON READER SERVICE CARD

INTRODUCING THE FIRST NOTEBOOK COMPUTER WITH A 6-FOOT SCREEN

The
Rever Cruiser —
LCD Projection
Panel and
Notebook
Computer
In One!



Create presentations on a full-function, powerful notebook computer, then let everyone in on the big picture. The Rever Cruiser's LCD screen quickly becomes an LCD projection panel, detaching and setting up on your overhead projector in just 30 seconds!

- Two compact models — Cruiser 3S (386SX) and Cruiser 2 (286)
- Both feature 40MB hard drive, crisp VGA display, normal-size keyboard, and multiple memory/power expansion options
- Sharp 640 x 480 line resolution, paper-white image, 16 shades of gray for high-contrast display on screen or wall
- Warranted for one full year

**CALL 1-718-723-8820 TODAY FOR MORE INFORMATION
AND THE NAME OF YOUR NEAREST REVER CRUISER DEALER**

Rever Cruiser Computers are marketed exclusively in the U.S. by NovaCorp International, Inc., Rochester, NY.

See the Rever Cruiser at Comdex, Booth S850, Sands Convention Center

CIRCLE 914 ON READER SERVICE CARD

**33-MHz
486
\$2,345**

- 4 MB RAM, 64 KB Cache RAM (Upgradable)
- 1.44 MB & 1.2 MB Floppy Drives
- 80 MB High Speed IDE Hard Drive
- FlickerFree™ 1 MB Super VGA (1024X768, 256 color)
- 14" 28 mm dpi Super VGA Color Monitor
- MS DOS 5.0, Logitech Mouse & Windows 3.0
- FREE! 9600 Baud FAX + 2400 Baud MODEM Card
- FREE! Express Call-Back service
- One-year Limited Warranty Parts & Labor
- Custom configuration available

For Orders
(1-800) 488-8186
Visa MasterCard accepted

DURA

Prices do not include shipping & applicable tax.
Picture shown with optional equipment.
DURA cannot be responsible for errors in
typography or photography.
Brand and product names are trademarks of their
respective companies.

CIRCLE 912 ON READER SERVICE CARD

THE HOTTEST SALE IN THE PC-HISTORY

WHITEFOX MICROSYSTEM PREMIUM	
14" Multisync Color Monitor (1024 x 768)	
Super VGA (11024 x 768) w/1MB VRAM	
1.2MB & 1.44MB Floppy Drive	
2S/PK Ports, 101 Enhanced Click Keyboard	
220W Tower Case w/8 Open Bays	
5-days Round Shipping Charged-Free Thai	
30-days Money Back Guarantee	
1-years Parts/Labor Warranty	
1-year G.E. On-site Service Option	
2MB RAM, 43MB IDE Hard	
286-12/16/20MHz	\$955/975/995
386SX-16/20/25MHz	\$1,095/1,145/1,195
64K Cache, 4MB RAM, 110MB IDE Hard	
386-25/33/40MHz	\$1,545/1,645/1,745
486-25/33/50MHz	\$2,145/2,245/2,345
128K Cache, 8MB RAM, 380MB SCSI Hard	
486-25/33/50MHz	\$3,145/3,245/3,295
256K Cache, 12 slots, 8MB, 380MB SCSI	
486-25/33MHz	\$3,245/3,395
128K Cache, 8MB RAM, 380MB EISA SCSI	
EISA 486-25/33/50MHz	\$3,945/4,095/4,295
Motherboard (AMI BIOS)	
286-12/16/20MHz	\$185/195/205
386SX-16/20/25MHz	\$235/275/315
386-25/33/40MHz	\$445/495/545
486-25/33MHz 64K Cache	\$845/945
EISA 486-25/33MHz 256K Cache	\$1,845/1,945
Math Co-processor	
Intel 387SX-16/20	\$1,125/1,175
Intel 387-25/33/40	\$205/206/230
Cyrix 387-25/33/40	\$1,125/1,175
ULSI 387SX-16/20	\$135/149
ULSI 387-25/33/40	\$165/185/235
Veritek 4167-25	\$575/625
Optical Drive w/SCSI	
Ricoh CD-ROM Internal 400ms	\$359
Chinon CD-ROM Int/Ext	\$379/479
Vista 3.5" 130MB Internal	\$2,495
Ricoh 5.25" 650MB External	\$2,795
Maxtor 5.25" 1.2GB Internal	\$3,695
Communication	
2400 Baud Int/Ext	\$52/89
2400 Baud MNP 5, Int/Ext	\$79/99
9600 Baud Internal V3242 Bis	\$299
9600 Baud Fax/Modem	\$99
Hard Drive	
Kalok 43/105MB IDE	\$159/299
Conner 40/120/210MB IDE	\$185/385/629
Rodime 90MB SCSI	\$279
Segate 100/170MB SCSI	\$359/459
Segate 210/375/1200MB SCSI	\$649/895/2,095
Maxtor 130/340MB IDE 15ms	\$395/999
Maxtor 210/1200MB SCSI	\$635/2,185
Maxtor 335/675MB ESDI	\$789/1,295
Fujitsu 780MB SCSI	\$1,895
Removable Hard Drive	
SyQuest 44/88MB 20ms SCSI Int	\$369/459
SyQuest 44MB/88MB Cartridge	\$99/139
Exabyte 8mm DAT 2.5GB	\$3,495
VGA Color Monitors	
14" NEC 3DS4DS/5DS	\$549/945/2,145
15" Relays NI 1024 Multiscan	\$479
17" NI Multisync 1024 x 768	\$795
17" Flat 1280 x 1024 NI 0.28	\$1,095
19" NI Multisync 1024 x 768	\$1,249
20" 1024 SVGA	\$995
20" Sampo PrismView 1280 x 1024	\$1,495
28" 1024 x 768 SVGA	\$1,795
Flatbed Scanner	
Pentax Grey SCST 300 dpi	\$749
Tamarack Color 300/600 dpi	\$1,149/1,295
Mouse	
Aliger Mouse	\$24
Microsoft Bus Mouse	\$89
Z-Nix Cordless Mouse	\$89
Z-Nix Mouse w/Windows 3.0	\$99
Z-Nix Cordless w/Windows 3.0	\$99
Miscellaneous	
Super Video Window	\$579
Super TV-Tuner, 122 Channels	\$299
OAK VGA w/256K RAM 800 x 600	\$69
TRIDENT VGA w/512K RAM	\$87
Trident Super VGA 1MB VRAM	\$99
Truepoint 800 dpi Postscript upgrade	\$1,395
w/4MB RAM for HP/Cannon laser	
JetFill HP/Cannon deskjet 2 Refill	\$17
Adaptec SCSI Host Adapter HDC/FDC	\$165
Omiti EISA SCSI HD/FD 32-bit	\$319
Ergo 3.5" 1.44MB Floppy	\$59
3.5" 2.88MB Floppy w/Controller	\$229

COMPUTER WORLD

5624 N. BERNARD ST., CHICAGO, IL 60659

ORDER: (800) 458-3172 TEL: (312) 588-0058 FAX: (312) 588-8145

CIRCLE 914 ON READER SERVICE CARD

• 10% OFF DISC DRIVE REPAIR COUPON •

CAPACITY	MEMBER	SOURCE	TEST & EVALUATION \$25	120-DAY WARRANTY
10-19Mb	\$59	N.A.	VALID THROUGH 8/31/91	ALL REPAIRS
20-29	75	75	WE REPAIR MOST MAJOR BRANDS	5-15 DAY
30-39	89	89	ALL DATA BACKUP	TURN AROUND
40-49	125	125		TIME
50-55	155	175		SEE US FOR
66-120	195	225		REPAIRING
121-160	225	275		THE HARD
161-340	259	345		WARE, Tapes
341-685	N.A.	395		

Phone: (800) 688-0908
FAX: (805) 529-7712

TECHNOLOGIES, INC.

5000 Alameda Drive, Alameda, CA 94501

• LOWEST DISC DRIVE PRICES IN THE U.S.A. •

CAP.	MODEL	SPECS.	BAR	XT KIT	AT KIT
20Mb	Kalok K-320	48MS MFM	129	179	189
30Mb	Kalok KL330	48MS RLL	139	179	209
64Mb	Miniscribe 3675	61MS RLL	169	209	225
80Mb	Microsci. HH1090	28MS MFM	349	399	399
120Mb	Microsci. HH1120	28MS RLL	389	439	439
323Mb	Miniscribe 9380E	18MS ESDI	395	N/A	995

CIRCLE 915 ON READER SERVICE CARD

ROM BIOS UPGRADES

Upgrades For Your IBM or Compatible From the Largest BIOS Distributor in America!

The ROM BIOS upgrades support 360K, 720K, 1.2MB & 1.44MB floppy disk drives; complete set-up in ROM, EGA and VGA support; optional built-in diagnostics in ROM (AMI only), Novell and Netware compatible, supports up to 48 different types of hard drives plus two user defined, IDE drive support; 84, 101 & 102 key keyboard support, 100% IBM compatible; supports speeds up to 33 Mhz; supports 0, 1 or 2 wait states; full OS/2 support; full Microsoft Windows support; complete documentation, latest versions available

Upgrading a BIOS chip is relatively easy, even a person with no computer experience can do it. We provide full installation instructions. If you have a problem just call our Tech Support Line, we are always there to help, we have the experience, we are the largest stocking BIOS distributor in America!



UPGRADES ETC
A DIVISION OF THINA TECHNOLOGIES

(800) 541-1943 WA
(800) 955-3527 CA

15251 NE 90TH STREET REDMOND, WA 98052
FAX (206) 881-8294
23930 CRAFTSMAN RD., CALABASAS, CA 91302
FAX (818) 992-3365

VISA MasterCard C.O.D.

■ XT BIOS UPGRADES

AMI-XT BIOS	59.95
PHOENIX-XT BIOS	59.95
PHOENIX-SPERRY XT BIOS	59.95
PHOENIX-TANDY 1000 BIOS	59.95
PHOENIX-KAYPRO PC-10 BIOS	59.95
PATERSON-TURBO XT BIOS	59.95

■ AT 286 BIOS UPGRADES

AMI-286 INTEL BIOS	79.95
AMI-286 CHIP & TECH BIOS	79.95
PHOENIX-286 INTEL BIOS	79.95
PHOENIX-286 AST BIOS	79.95
PHOENIX-COMPAQ 286 BIOS	79.95
PHOENIX-EPSON EQUITY III BIOS	79.95
PHOENIX-DTK 286 BIOS	79.95

■ AT 386 BIOS UPGRADES

AMI-386 INTEL BIOS	79.95
AMI-386 CHIP & TECH BIOS	79.95
AMI-386-SX INTEL BIOS	79.95
AMI-386-SX CHIP & TECH BIOS	79.95
PHOENIX-386 INTEL BIOS	79.95
PHOENIX-386 COMPAQ BIOS	79.95
PHOENIX-386 CHIP & TECH BIOS	79.95
PHOENIX-386-SX INTEL BIOS	79.95
PHOENIX-DTK 386 BIOS	79.95

■ IBM BIOS UPGRADES

PHOENIX-IBM-PC BIOS	79.95
PHOENIX-IBM-XT BIOS	59.95
PHOENIX-IBM-AT BIOS	89.95
AMI-IBM-PC BIOS	79.95
AMI-IBM-AT BIOS	89.95

AMI-286/386 KEYBOARD BIOS	34.95
PHOENIX-286/386 KEYBOARD BIOS	34.95

CIRCLE 916 ON READER SERVICE CARD

ANNOUNCING
Computer Select™

With COMPUTER SELECT you'll never again risk making the costly mistake of acquiring the wrong product. Now, using your own PC, you can identify, evaluate and select the best products that meet your requirements and your budget. Easy-to-use search software lets you quickly retrieve the documents you need from the vast database of product reviews, specifications, announcements and buyer's guides.

Get instant access to more than...

- 70,000 articles and abstracts each month
- Complete specs for 70,000 hardware, software and communications products
- Profiles of 12,000 companies, including addresses and phone numbers
- 9,000 definitions of computer and telecommunications terms.

Discover the power of this new CD-ROM product. Call

The Most Complete Database of Computer Product Information Available

now for your free, no-obligation demo disk. Then, if you wish, you can subscribe for \$995.*

LIBRARY™

One Park Avenue,
New York, NY 10016

CALL NOW FOR A FREE DEMONSTRATION DISK
212-503-4400

Computer Library and Computer Select are trademarks and Data Sources is a registered trademark of Ziff Communications Company. ©1991 Ziff Communications Co.
*U.S. and Canada only. Outside U.S. \$1195

UnMouse™

Incredibly Productive. Ingeniously Creative.

Move the cursor effortlessly. Just slide your finger over the glass, then press to click. Plus you can select up to 60 programmable function keys. And it even works with a stylus.

- So Easy, It's Intuitive
- Faster than a Mouse
- Programmable Keypad
- Stationary, Saves Space
- Draw, Trace, Doodle

Call
1-800-UNMOUSE



TEL: 508-694-9900
FAX: 508-694-9980

MicroTouch

CIRCLE 917 ON READER SERVICE CARD

PRINTER & PERIPHERAL SHARING

DATA SHUTTLE

The Product Recommended for Performance, Compatibility & Reliability



PC
MAGAZINE

Features:

- 68000 CPU
- processes 70,000 CPS
- serial baud rates from 300 to 115,200
- 8 bi-directional serial ports
- 4 configurable parallel ports
- up to 8 meg of ram
- completely programmable
- supports file transfers & daisy chaining
- suggested list \$899
- dealers invited

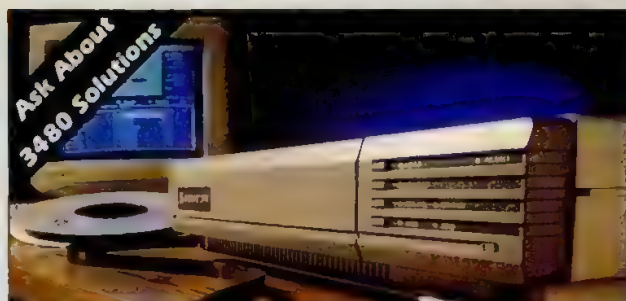
"Speed to spare. The Data Shuttle turned in excellent overall performance results on our timed performance tests."

"Installation is standard fare. Less experienced users will appreciate the step by step instructions in the manual along with the install program which handles much of the work."

INSTRUMENTS INC.

OVER 35 OTHER CONNECTIVITY PRODUCTS AVAILABLE
1-800-268-5756 U.S. 1-416-842-0200 CDN.

CIRCLE 918 ON READER SERVICE CARD



9-Track Solutions for Today's PC Desktop

Come to Overland Data for modern PC 9-track solutions:

- Space-saving, low weight 1600 bpi subsystems with durability backed by a two year warranty.
- High capacity 6250 bpi subsystems with speed to match
- The latest software for data interchange and backup, with a friendly, intuitive interface
- OSSP, the most comprehensive customer support program in 9-track. It's the best insurance for your investment.

We bring you state-of-the-art 9-track solutions for today's PC desktop. Because for the modern PC user, nothing less will do.

See us at COMDEX, Booth # 672

OVERLAND DATA 1-800-PC9-TRAK
 1-800-729-8725 • Bus. Phone: 1-419-571-5555 • FAX: 1-419-571-0982

CIRCLE 919 ON READER SERVICE CARD



"The clear winner among half-inch nine-track tape back-up devices"

NineTrack Tape Sub-Systems

PC Magazine

New high-performance, easy-to-install software make the Ch NineTrack even faster and easy to use. NineTrack gives you the power to read and write to 9-track tape with your IBM® PC XT/AT/386/486 PS/2 and compatibles. Exchange data with other PCs, minis and mainframes. 1600/3200/6250 BPI systems are available.

New software features:
 • Data transfer rate of 1MB per second for PC bus
 • Full menu support or execute commands from DOS prompt or batch files
 • Expert Support System
 • Hard disk back-up utilities

Call us today. 800-828-0599 216-349-8600



Computer Logics
 31200 Carter Street
 Cleveland, OH 44139
 Fax 216-349-8620

CIRCLE 920 ON READER SERVICE CARD

3480 - 9TRACK FOR PCS AND WORKSTATIONS DOS • SUN • MAC • UNIX • XENIX • RS/6000 TAPE DUPLICATOR SYSTEMS

MANUAL/AUTOLOAD DRIVES 50/125 IPS
 SCSI/PERTEC 800/1600/3200/6250



GSA SCHEDULE

- TAPE DRIVE RENTALS
- CONVERSION SERVICES

1-800-362-6250

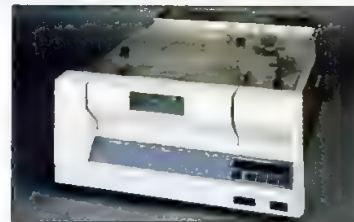
FAX: 301-309-8355
 Rockville, Md.



CIRCLE 921 ON READER SERVICE CARD

9 TRACK TAPE DRIVES 3480 TAPE DRIVES FOR PC/XT/AT/386/386/PS2

LOWEST
 PRICES
 BEST
 QUALITY



LAGUNA DATA SYSTEMS

26941 Cabot Road
 Suite 131
 Laguna Hills, CA 92653-7007



(800) 266-4827
 (714) 367-0497 TEL.
 (714) 367-0508 FAX

CIRCLE 922 ON READER SERVICE CARD

FAST 9-TRACK for MICRO's

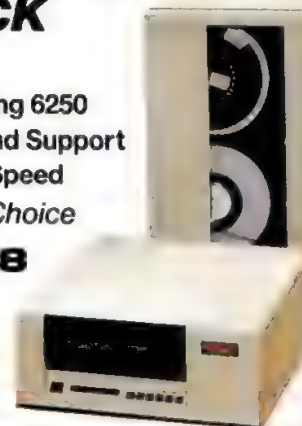
- All Densities – including 6250
- Excellent Software and Support
- Reliability • Super Speed

The Only Professional Choice

800/842-0708

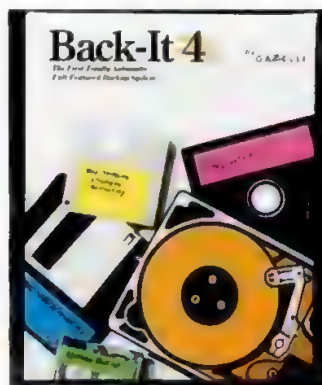
TDX
PERIPHERALS
TDX

HAUPPAUGE, NY • 516/273-5900



CIRCLE 923 ON READER SERVICE CARD

TOTALLY RELIABLE BACKUPS... GUARANTEED!



Back-It 4:

The First
 Totally Automatic,
 Full-Featured
 Backup System
 Which Virtually
 Eliminates Your
 Excuses for Not
 Backing Up!

Who Needs Back-It 4?

- Anyone who is in jeopardy of losing everything by not having a current backup copy of their hard disk.
- Anyone who despises spending time backing up and wants to schedule and run automatic, unattended backups.
- Anyone who wants the fastest backup and compression around.
- Anyone who would like unlimited toll-free customer support and a 60-day money-back guarantee for ultimate peace of mind.
- Everyone...see your local dealer today!

GAZELLE 800-233-0383

Gazelle Systems, Inc. • 305 North 500 West • Provo, Utah 84601 • (801) 377-1288

CIRCLE 924 ON READER SERVICE CARD

Raster-to-Vector Conversion Software

Scan into CAD and most other drawing programs!

Before Envision It
Conversion: TIFF
(raster file)After Envision It
Conversion: DXF
(vector file)

1-800-321-ENVY (3689)
30-Day, 100% Money Back Guarantee!

\$299 Envision It software (retail \$399)
\$399 Envision It bundled with
The Complete Half-Page Scanner (retail \$699)

CIRCLE 925 ON READER SERVICE CARD

How the HECK can VP-Info OUTperform \$795 database languages for only \$189?

We can do it because we're small, hungry, lean and mean. And we mean business. But don't just take our word for it... check out the rave review on VP-Info Professional in the May 28/91 PC Magazine cover story on Relational Databases. Or write/fax us for your free reprint. Now, how the heck can you beat that?



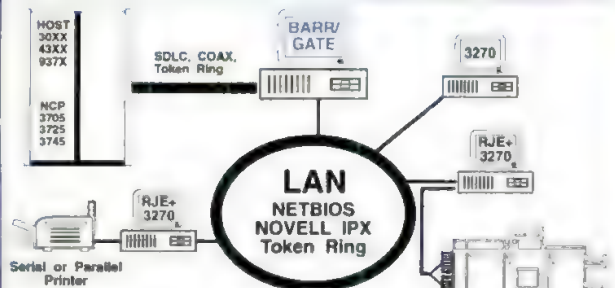
VP-Info
 PROFESSIONAL

\$189 Single-User \$369 Network

1313 5th St. SE, Minneapolis, MN 55414
 1-800-55-INFO5 or 612-379-3898

Buy Direct & Save! Satisfaction guaranteed or money back!

CIRCLE 928 ON READER SERVICE CARD

**Powerful LAN-to-Mainframe Solution:
BARR/GATE**

BARR/GATE delivers maximum performance with the complete LAN-to-mainframe communications solution.

BARR/GATE combines high-speed RJE (up to 384,000 bps) and 3270 in one integrated product. And it supports up to 254 simultaneous LUs. PC workstations are capable of multiple 3270 sessions. Options include: RJE (featuring print spooling with printing speeds up to 20,000 lines-per-minute), tape drive support, and S/370 channel-attached printer support.

The Barr gateway solution will reduce your costs and boost your productivity. Call Barr Systems today for a 30-day evaluation.

More Speed • More Features • More Solutions



Barr Systems, Inc.
 800-BARR-SYS • 800-227-7797 • FAX 904-371-3018

CIRCLE 926 ON READER SERVICE CARD

Replaces Key-to-Disk Systems

ENTRYPPOINT Pro

DATA ENTRY FEATURES

- ▶ Headsdown speed
- ▶ Paint-the-screen form design
- ▶ Menu-driven edit selection
- ▶ Field and char type validation
- ▶ Range checks
- ▶ Table lookup
- ▶ Check digits
- ▶ Accumulator balancing
- ▶ Programmable function keys
- ▶ Operator statistics
- ▶ LAN or single station
- ▶ French & German versions

SUPPORT

- ▶ Toll-free support hotline
- ▶ 24-hour electronic bulletin board
- ▶ International distribution and support
- ▶ Award-winning manuals
- ▶ On-site training & consulting

DATALEX
800-962-8888
 From Canada 1-800-848-5548
 FAX 415-362-5733

CIRCLE 929 ON READER SERVICE CARD

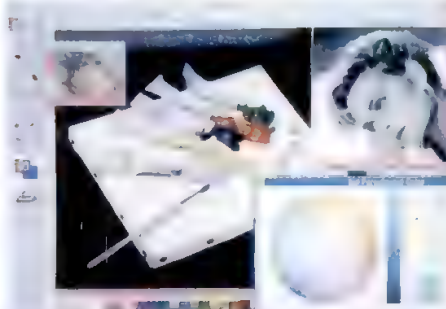
**How to Make Great
Color Images!**

Image-In-Color software for Windows 3.0 is the most advanced true-color, CGA, VGA or 24-bit image processing system available for the PC! Spectacular functions provide a darkroom on your desk, with precise control of pressure, density and size of retouching tools such as pencil, paint brush, air brush and others. Clone items in an image instantly! Use photographic filters for powerful dimensions in design. CMYK color separations are super fine-tuned and calibrated by Agfa Compugraphic. Supports HSV and RGB color, with intuitive color picking. Supports all popular scanners and 16- or 24-bit video boards including:

Hercules
 Matrox
 Mona Lisa (OPTA)



Raster Ops
 Truevision
 Video 7

IMAGE-IN
 INCORPORATED

1-800-345-3540

406 E. 79th St. • Minneapolis, MN 55420 • FAX 612-888-3665
 Outside N. America call CPI, Geneva ++41-22-436-800

CIRCLE 930 ON READER SERVICE CARD

Multi-User Corporate BBS

For your PC, XT, AT 186 or 486-compatible

- ✓ Electronic Mail
- ✓ Teleconferencing
- ✓ File Transfer
- ✓ Public Message Bases
- ✓ Polls & Questionnaires
- ✓ and more!

The Major BBS
 works with MVS (308)
 3.1 or higher and
 ECOM 1/2/3/4 modules

Call (305)583-5990 now to order your \$59 starter package!

GALACTICOMM

CIRCLE 927 ON READER SERVICE CARD

Mac - In - Dos

BREAK THROUGH!!! Allows your PC to read/write Mac 1.44 high density diskette. Exchange of text, binary & graphics files between Mac & DOS computer, IS NOW POSSIBLE with this software program. No cable or extra hardware is needed. Compatible with both System 6 & 7 MAC 1.44 MB Diskettes



COMMON-LINK™
Available for Sun Sparc,
IBM RS/6000 HP
Interactive UNIX AIX on PS/2

To Order Call
1-800-628-DISK

Pacific Micro
201 San Antonio Cir., C250
Mt. View, CA 94040
TEL: (415) 948-6200
FAX: (415) 948-6296

CIRCLE 931 ON READER SERVICE CARD

DANCE OF THE PLANETS™

SPACE TRAVEL FOR THE INQUIRING MIND



It is the most imaginative and imagination-inspiring software that I have yet seen running on a PC.

Richard Berry, Astronomy

1-800-SKY-1642

A.R.C. Science Simulation Software
P.O. Box 1955P, Loveland CO 80539

For IBM compatibles, 640k EGA/VGA, HD Math co-processor highly recommended
\$25 \$195 + shh Literature available Phone 1-800-667-1168 Fax 1-677-1105

CIRCLE 932 ON READER SERVICE CARD

Free Windows Tips.

Call Toll Free:
1-800-223-8720 Ext. 726

* from The Cobb Group's newsletter
Inside Microsoft Windows.

ANNOUNCING A REMARKABLE NEW PERSONAL FINANCE SYSTEM

"A lot like QUICKEN...
but much easier to use!"

59.95

**100% GUARANTEED
INCLUDING SHIPPING**

For the personal small business user **BoldLine - Finance** provides the basics (entering of checkbook credit card cash transactions, organizing tax data, balancing checkbooks, printing checks, generating reports, tracking investments) plus a lot more, with an emphasis on simplicity, consistency and accuracy.

Additional features include:

- loan/mortgage analysis • retirement planning
- stored payer names and addresses
- automatic principal interest split computation
- fixed asset depreciation • enhanced budgeting

"DEFINITELY A STEP UP"

**BoldLine
Finance**

Visa/MC Credit Card Orders: 1-800-766-2672 EXT. 6972 or
send information including disk size to RDS Software, Inc.
P.O. Box 25250, Hilton Head, SC 29925 **(803) 689-6230.**

©1991 RDS Software, Inc. All rights reserved. BoldLine Finance is a registered trademark of RDS Software, Inc. QUICKEN is a registered trademark of Intuit, Inc.

CIRCLE 933 ON READER SERVICE CARD

Loan Amortization Software

A favorite of banks & atty's worldwide!

Over 5000 sold!

- ✓ Easy Amortization Schedules
- ✓ Replace Financial Calculators
- ✓ Change variables instantly



**FOR A FREE TRIAL
CALL 1-800-766-2672 EXT. 6972**

CIRCLE 934 ON READER SERVICE CARD

BrainMaker
Neural Networks
Give your PC
human skills.



"BrainMaker is the
most fascinating
computer software
I've ever seen."
John Dvorak
PC Magazine

Find patterns and hidden relationships in data and learn from the past. Read in data from Lotus, dBase, Excel, binary, and ASCII. Menus, dialog boxes, color, mouse support, great manuals. Stock and bond forecasting, pattern recognition, commodities, futures, and more.

Mac version now available
30 day money back guarantee!
BrainMaker is \$195 Professional is \$795
Free Catalog: 800/284-8112, 916/477-7481
California Scientific Software

CIRCLE 935 ON READER SERVICE CARD

ANNOUNCING



Version 7.0

- Full Color Support
- Network Support
- Global search & replace
- 3D Charting
- Over 270 output devices supported

DON'T buy any flowcharting product until you test drive EasyFlow. Unprecedented support for Desktop Publishing & Graphics packages, Alternate Shape Libraries, FREE tech support and a NO RISK 30 Day Money Back Guarantee all combine to make EasyFlow the industry leader and corporate standard.

Special Introductory Offer \$230
Plus Shipping

HavenTree Software Limited
P.O. Box 1093-P
Thousand Island Park, NY 13692
Telephone: (613) 544-6035 Ext.49
Fax: (613) 544-9632



ORDER HOTLINE 1-800-267-0668

CIRCLE 936 ON READER SERVICE CARD

New Features

- Shaded contour plots
- Color PostScript
- Export HPGL/2 and TIFF
- TIGA, DGIS, and 8514 support
- Simultaneous plots
- European characters
a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, ., -, +, =, %, &, *, /, ^, _
- Polar contour plots
- Error function plots
- Color separations

Licensed for personal use only

Order now - \$465
Visa & MasterCard

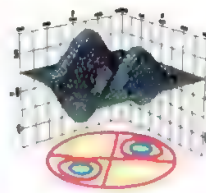
Scientific Endeavors

508 N. Kentucky St.
Kingston, TN 37763

PC Magazine

FAX 615 376 1571

GraphicC™ 6.0



"All of the C language routines you need to write an impressive scientific graphing program of your own. Highly recommended"

PC Magazine

CIRCLE 938 ON READER SERVICE CARD



Slides From Your PC Try Us FREE!

We want your business. And we'll prove it! We offer the best service available. Experts in Harvard, Freelance, Corel and others on staff to serve you. Free Federal Express shipping. Toll-free Customer Service. And if you should make a mistake, we'll reshoot your slides, free. Call today, and say "I'd like to try your service. Free."

1-800-222-2592



Accent Presentations, Inc.

12780 High Bluff Drive, Ste 250 • San Diego, CA 92130

SIMPLY THE HIGHEST QUALITY
IMAGES ANYWHERE

**RAD
Graphics**

**Special Holiday Prices
Limited Time Offer
800x600x256 PCX Images**

- Makes a great gift
- Dazzle your friends
- Works with your favorite word processor, publishing or graphics application
- Use as Windows Wallpaper
- DOS & Windows viewers included
- Windows users convert files to BMP, GIF, IMG, PIC, TIFF and WPG
- Over 5MB in every volume
- Comes on 5 high density disks
- Hard drive not required

- #901 Mother Earth:
Breathtaking views of oceans, islands, volcanoes & sunsets
- #902 Space Things:
Stunning images of planets, galaxies, satellites & the stars
- #903 Amazing Animals:
An educational look at mysterious animals around the world
- #900 Graphics Starter Kit - included with every order - \$10
A collection of DOS and Windows utilities with Preview Images.

Add \$3 for S&H
Add \$3 for Foreign
Add \$3 for 3.5" disks
FL add 6% sales tax
Send check or money order to:
Starware Publishing Corp
P.O. Box 4185, Dept. 50
Deerfield Beach, FL 33442
For more information call
(305) 426-4552



One Volume = \$29.88
Two Volumes = \$49.88
Three Volumes = \$59.88

24 hour 7 days
To order, call

800-354-5353

US and Canada

CIRCLE 937 ON READER SERVICE CARD

CAPTURE YOUR SCREEN!



1-800-284-2574

Print any screen on your dot matrix, laser or inkjet printer. An immediate hard copy at the touch of a key. Only \$59.95

- Supports Windows 3.0
- 256 Color Support
- Clips Graphics
- Saves PCX/TIFF Files
- Linkable / OEM Version

JEWELL TECHNOLOGIES, INC.

(206) 285-6860 FAX (206) 285-7340
130 Nickerson St., Suite 105, Seattle, WA 98109

CIRCLE 939 ON READER SERVICE CARD

Sourcer™ 486 - Commenting Disassembler

Sourcer creates commented source code and listings from memory .COM or .EXE files. It helps you understand the inner details of how programs work. With the BIOS Pre Processor, generate commented listings of all your BIOS ROMs. \$169.95

"Sourcer is the best disassembler we've ever seen!" PC Magazine

ASM Checker™ - Locates Coding Problems

ASM Checker automatically locates common coding errors in assembly source code. By identifying errors that are often hard to find and easily overlooked, it saves you countless hours of debugging time. It also cross-references external and public symbols and identifies unused symbols and type mismatches. \$179.95

- **ASMT001 486™** - Create flowcharts and procedure call diagrams \$199.95
- **View-It™** - Super fast file viewer - see 132 columns on screen \$69.95
- **Unpacker™** - Unpacks packed EXE files, interrupt viewer, and more \$39.95
- **ASM ProPak III™** - Includes all six products above (Save over \$100) \$549.70

Shipping & Handling \$6 Canada/Mexico \$10 Other \$18 CA residents add sales tax VISA/MC/AMEX
V Communications, Inc. Call **1-800-648-8266**

4320 Stevens Creek Blvd. Suite 275 Dept PC San Jose, CA 95129 408 296 4224

Beat the Bible Study Blues... only \$69⁹⁵

Looking for a better way to study the Bible? Just load BibleSource on your PC. BibleSource is powerful, modular software that allows you to do instant searches, even build a customized Bible Study library. For a limited time, you can buy any BibleSource module, including the KJV or New International Version for only \$69.95! It's easy to learn and easy to use. Plus all our software has an unconditional 60-day moneyback guarantee. You'll find BibleSource in stock at your local Christian bookstore.

LIMITED TIME **\$69⁹⁵** ea

1-800-727-7759

Zondervan Publishing House
Software and Electronic Products

CIRCLE 940 ON READER SERVICE CARD

Need more room on your hard disk?



Doesn't everybody?!!

Increase your disk space 2-3 times, on-the-fly, with the fastest, most advanced PC data compression product!

- FASTEST compression solution available.
- No artificial DOS commands
- Easiest installation and use.
- Completely safe and transparent
- Reduces the number of floppies required for backup by 50% or more.
- Disk Defragmentation program included free (a \$50 value).



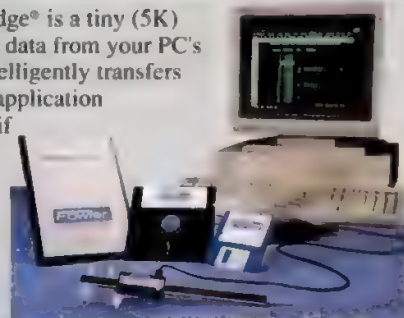
AddStor
AddStor, Inc.
3905 Bohannon Drive
Menlo Park, CA 94025
1-800-732-3133

CIRCLE 941 ON READER SERVICE CARD

Input data from ANY Serial Device... To ANY Software Program...

The SoftwareWedge® is a tiny (5K) TSR that captures data from your PC's serial port and intelligently transfers it into your DOS application program - just as if it were typed at the keyboard...

Quickly. Simply and Efficiently!



The SoftwareWedge® 4.0

- Supports all COM Ports
- Baud Rates up to 19.2k
- Alpha/Numeric Filtering
- Keystroke Macro Insertion
- "HotKey" Data Request
- Full Input Translation Table
- Auto Time/Date Stamping
- Fast & Efficient Operation
- Simple to Configure and Use

Integrate data directly from your electronic testing and measuring instruments, scales and bar code readers straight into DOS applications such as Lotus 123 or Dbase without the pain and hassle of file transfers, imports or clumsy, expensive hardware methods...

The SoftwareWedge® costs just \$129.00. It is supplied with both 3.5 & 5.25 diskettes, full tutorial instruction manual and free phone support. It will run on any PC or MS Dos computer (Ver. 2.0+) equipped with a serial port.

Call or write today for more information:



Fred V. Fowler Co., Inc.

BOX 299 NEWTON, MA 02166 (617) 332-7004

CIRCLE 942 ON READER SERVICE CARD

KeySkin™ Keyboard Protectors and Dust Covers

From the World's Leader in Computer Protection



Quality - Selection - Service - Fast Delivery

CompuCover Inc.

2104 Lewis Turner Blvd.
Fort Walton Beach, FL 32547

Order Line (800) 874-6391

Service (904) 862-4448

Fax (904) 863-2200

CIRCLE 943 ON READER SERVICE CARD

LABEL MASTER

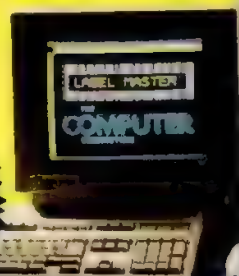
Print Perfect Labels and Forms In-House On Almost Any Printer

- WYSIWYG layout • Money back guarantee
- Supports matrix, laser, thermal printers
- Supports most bar codes and text fonts
- Supports graphics images
- Label Master \$479 • Quick Draw \$259
- Developers library with source - \$389

THE COMPUTER CONNECTION

P.O. Box 634 • Eau Claire, WI 54702
(715) 833-2331 • Fax: (715) 833-1995

(800) 552-2331



CIRCLE 944 ON READER SERVICE CARD

HARDWARE/ADD-IN-BOARDS

COMPUTER SYSTEMS

MEMORY UPGRADES		ROBOFAX SHOPPING MALL
COMPUTERS	FAX MODEMS	
APPLE, AST, AT&T, COMPAQ, DATA GENERAL, DEC, EPSON, EVEREX, IBM, HEWLETT PACKARD, NEC, PANASONIC, SILICON GRAPHICS, SHARP, SUN, TEXAS INSTRUMENTS, TOSHIBA, ZENITH	COMPAQ MAXFAX9624LT-C 9600bps/2400bps/Group III IBM & Compatible MAXFAX9624 9600bps/2400bps/Group III MAXLITE/PC (Portable) 9600bps/2400bps/Group III	Open 24 hours Call 800-424-3299
NOTEBOOK MEMORY	TOSHIBA MAXFAX9624LT-T 9600bps/2400bps/Group III	Have your fax # ready. Follow voice instructions.
COMPAQ, TOSHIBA, ZENITH		
SIMMS SIPPS	PRINTER MEMORY	
1MB x 8, 4MB x 8, 70ns & 80ns 1MB x 9, 4MB x 9, 70ns & 80ns	Apple, Canon, Epson, HP, IBM, Okidata, Panasonic....	

ADD-ON AMERICA
A DIVISION OF BUSH CORPORATION

Toll Free 800-292-7771
433 N. Mathilda Avenue, Sunnyvale, CA 94086
TEL (408) 746-1590 FAX (408) 746-1593



REMOTE ACCESS

Office & Home Computers
Network Servers • Remote Booting

- Call-in & activate computer On or Off with touch-tone code
- 1-10 Selectable rings with answer machine compatibility
- Increase security. Save energy. Extend hardware life
- Compatible with communications & remote control software
- Additional Multi-Unit Remote Control options available
- U.S. Patent 5,100,000 Registered & Fully Guaranteed

\$129.95-\$499.95
24 Hour Ordering
Vent Systems, Inc. 5210 Lewis Rd. Suite 8, Agoura Hills, CA 91301
TEL 818-706-1733 FAX 818-779-2643
CIRCLE 551 ON READER SERVICE CARD

LOWEST COMPONENT PRICES

MOTHERBOARDS	
386 Sx 16 MHz OK	\$239.00
386 DX 25 MHz OK	\$379.00
386 DX 33 MHz 64K cache OK	\$480.00
486 DX 25 MHz 8K cache OK	\$1059.00
486 DX 33 MHz 64K cache OK	\$1098.00

OTHER COMPONENTS	
SUPER VGA (1024x768, 256K)	\$58.00
MONO GRAPHICS/LPT PORT	\$16.00
INTERNAL 9600 FAX/2400 MODEM	\$19.00
INTERNAL MODEM 2400/9600	\$49/439.00
101 KEY ENHANCED KBD.	\$39.00
1 MEG SIMM	\$48.00
IDE DISK CONTROLLER	\$16.00
FLOPPY DRIVES (1.2 OR 1.44)	\$65.00
CASES IN ALL SIZES (UL/P/S)	CALL

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

F1 Associates
Pleasant Hill, CA (415) 827-5447
CIRCLE 553 ON READER SERVICE CARD

CD-ROM

CD-ROM / WORM / ERASABLE

Multi-Media Products
LAN Support
OS/2, Unix, Xenix Support
Computers, Peripherals, Accessories

386 notebook "Virtual Office"\$3,500
CD-ROM drives from\$499
NEC CDR-36 15 disc bundle.....\$999

QSA# Q500K90AGS5317
call for free catalog
1-800-MEGABYTE
Phone: 800-290-0048
Fax: 800-290-8087

CDP
Compact Disk Products
272 Route 34, Aberdeen, NJ 07747
CIRCLE 552 ON READER SERVICE CARD

COMPUTER SYSTEMS

SAVE SAVE SAVE SAVE SAVE SAVE
LAPTOP SPECIALS
AND LOW, LOW PRICING

LATEST LAPTOP & NOTEBOOK MODELS
TOSHIBA • EVEREX • ZENITH • ALR
BONDWELL • SHARP • TI • SANYO
AST • ALTIMA • AT&T • SAMSUNG
PACKARD BELL • PANASONIC

Call For Availability Of Other Models

Computer Options
UNLIMITED
12 Maiden Lane, Bound Brook, NJ 08805
OPEN MON-FRI 9AM-5PM SAT 9AM-5PM EST
TO ORDER: 1-800-424-7678
Need Help? 908-469-7678
Buy With Confidence From The Laptop Specialists

SAVE SAVE SAVE SAVE SAVE SAVE
CIRCLE 554 ON READER SERVICE CARD

To place your ad in

PC MAGAZINE CLASSIFIED

Call (212) 503-5115
or (800) 825-4237

AMI 386/486 ISA & EISA CACHE MOTHERBOARDS

6/3/91 PC WEEK pg. 113 proved AMI is the BEST! We are the largest AMI reseller! Best price guaranteed!

PC WEEK Rated Cyrix #1 80387-25 \$179, 80387-33 \$199

Refsys 9514 Super VGA 14" Monitor 1024 x 768 28 W/Orchid ProDesigner II Bundle Only \$429 While they last!

Maxtor, Microscience & Micropolis Drive Bundles
120 MB IDE Adapter \$399 / 340 MB ESDI W/Ultrastor 12F \$1199

PC PROS 708/810-1010 FAX 9490
8205 S. Cass Ave., Darien, IL 60559
CIRCLE 557 ON READER SERVICE CARD

486-33 MHz CACHE

Since 1985, MSE has been dedicated to bringing you high-quality American designed, engineered and built computer systems for a wide range of applications. NOW, for our 6th year anniversary special, we are proud to introduce our fastest and most powerful machine, the 80486-25MHz or 33MHz.

MicroCache 386 \$1695

- Intel 80386 33MHz CPU
- 385 33MHz CACHE Controller
- 4MB RAM expands to 32MB
- 200MB Fast Dr (15ms)
- 12MB Floppy Dr
- 2 Serial Parallel
- Enhanced Keyboard
- 58 5MHz Landmark
- 128K Cache Option

MicroCache 486-33MHz

- 80486 33CPU 4MB RAM
- 12MB Floppy Dr
- 125MB Fast Dr (18ms)
- 64K Cache (15ns)
- Enhanced Keyboard
- 150 MHz Landmark

\$1895

MicroCache 386SX-20MHz

- 386SX-20 CPU 1MB RAM
- 12MB Floppy Dr
- 84MB Fast Dr (18ns)
- 32K Cache (25ns)
- Enhanced Keyboard
- 30MHz Landmark

\$895

Micro 386 SX-16MHz

- 80386 CPU 1MB RAM
- 12 MB Floppy Dr
- 42MB Fast Dr (22ms)
- Serial Parallel
- Enhanced Keyboard
- 20MHz Landmark

\$695

Motherboard Special

386SX-16MHz W 1MB RAM **\$289**
386SX-20MHz W 32K Cache 1MB RAM **\$399**
386-33MHz W 64K Cache 4MB RAM **\$799**
486-25MHz W 64K Cache 4MB RAM **\$1199**
486-33MHz W 64K Cache 4MB RAM **\$1299**

SALES HOURS:
Monday - Friday
9:00 AM - 5:30 PM
Saturday
10:00 AM - 3:00 PM
PST

MS ENGINEERING, INC.
10601 S. De Anza Blvd., Suite 214
Cupertino, CA 95014
(408) 257-4249 FAX: (408) 257-4398
486, 386 and 387 are trademarks of Intel Corp.

CIRCLE 555 ON READER SERVICE CARD

EXSEL DIRECT
1-800-624-2001
In NY: 716-272-8770

Refurbished IBM's!

XT 10MB HD, 640K RAM...	\$329
XT 20MB HD, 640K RAM...	429
AT 20MB HD, 640K RAM...	799
AT 30MB HD, 640K RAM...	879
AT 60MB HD, 2MB RAM...	899
PS/2 25 MONO.....	499
PS/2 25 20MB HD.....	599
PS/2 30-E21 80286.....	699
PS/2 30-E21 80286.....	988
PS/2 30-E31 80286.....	1099
PS/2 50-E21 80286.....	949
PS/2 502-031 80286.....	1049
PS/2 502-061 80286.....	1089
PS/2 555X-031 80386 SX.....	1595
PS/2 555X-061 80386 SX.....	1799
PS/2 60-041 80286.....	1299
PS/2 60-071 80286.....	1499
PS/2 70-E61 80386.....	1999
PS/2 70-061 80386.....	2325
PS/2 70-121 80386.....	2799
PS/2 80-041 80386.....	2499
PS/2 80-071 80386.....	2699
Compaq Deskpro 386 40MB	1499

PRINTERS • MODEMS • MONITORS • BATTERIES
AND MORE CALL TODAY

Call for custom configuration.

EXSEL INC.
THE ALTERNATIVE SOURCE FOR THE FUTURE
2200 Brighton-Hennetta Townline Rd.
Rochester, NY 14623 Fax # (716) 272-8624
All units refurbished with 90 Day Warranty, VISA,
MasterCard, prepayment, C.O.D. certified accepted.
Prices Subject to Change.

CIRCLE 558 ON READER SERVICE CARD



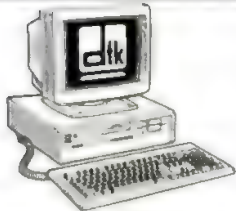
BIG SAVINGS



COMPUTER SYSTEMS

SCANNERS

PC - SOFTWARE



80286-16MHZ

T1632-140X

- Slimline case
- 1MB xpnble to 5MB
- 5.25" Disk
- 3.5" Disk
- 40 MB Hard drive
- 256K Super VGA Card
- 2Serial ports
- One parallel port
- Game port
- 101 Keyboard
- 14"VGA Color Monitor
- MS DOS 4.01

\$1,195



80386-25MHZ

K2530-212X

- Desktop case
- 2MB xpnble to 8MB
- 5.25" Disk
- 3.5" Disk
- 124 MB Hard drive
- 256K Super VGA Card
- 2Serial ports
- One parallel port
- Game port
- 101 Keyboard
- 14"VGA Color Monitor
- MS DOS 5.0

\$1,997



LOGITECH

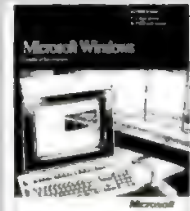
- Scanman32 GS for IBM.....\$149 50
- Scanman32 GS for Mac.....\$149 50
- CANNON IX-30F scanner /PC.....\$1,294.50

ANALOG

- Scan 300 COLOR
- 24Bit w/Photoshop.....\$957 50
- Scan 300GS
- w/Mac interface and photoshop Kit.....\$957 50
- Transcribe 300 w/OmniType.....\$839 50

MICROTEK SCANMAKER

- GS 6000
- PS/2 interface card & software.....\$1,039.50
- GS 6000
- PC interface card & software.....\$1,039.50
- Color 6002 PS/2
- interface card & photostyler.....\$1,323.50
- Color 6002 PC
- interface card & photostyler.....\$1,323.50
- XEROX DATACOPY
- GS Plus AT/PC 300 DPI.....\$1,323 50
- GS Plus PS/2 300 DPI.....\$1,454 50



Microsoft

DOS 4.01...\$74 50
DOS 5.0...\$79 50

WINDOWS APPLICATIONS

- Windows 3.0.....\$ 88.50
- MS Excel for Windows.....\$296 50
- MS Word for Windows.....\$297 50
- MS Windows Developer's Kit.....\$297 00
- MS Office for Windows.....\$446 50
- MS PowerPoint for Windows.....\$297 50
- MS Project for Windows.....\$418 50
- MS Windows Entertainment Pack.....\$27 00
- MS Productivity Pack.....\$38.50

Desktop Publishing APPLICATIONS

- Adobe Illustrator for Windows.....\$277.50
- Adobe Type Manager.....\$58.50
- Adobe Type Manager Plus Pack.....\$114.50
- After Dark for Windows.....\$25 50
- Aldus PageMaker V4.0.....\$488 50
- Asymetrix Toolbook.....\$277 50
- BitStream Facelift.....\$56.50
- CAERE OmniPage 386.....\$424 50
- CAERE OmniPage Professional.....\$598 50
- Corel Draw 2.0.....\$358 50
- Crosstalk for Windows.....\$118 50
- Grammatik IV for windows.....\$54 50
- Informix Wizard for Windows.....\$298 50
- Micrographix Draw+.....\$148.50
- Micrographix Designer.....\$448.50
- Publisher PowerPack for Windows.....\$44.50
- Xerox Ventura Gold.....\$498.50

Productivity APPLICATIONS

- LOTUS AMI.....\$114 50
- LOTUS AMI Professional.....\$284 50
- LotusWorks.....\$97 50
- Microphone II.....\$198 50
- Peachtree Crystal Accounting.....\$174 50
- Perform Pro Filler.....\$134.50

ELECTRONIC REFERENCE PRODUCTS



Franklin's

- SA95 Credit Card Speller.....\$29 50
- SA98 SPELLING ACE.....\$39 50
- WM 1055 Word Master.....\$57 50
- LM-2000 Language Master.....\$99 50
- LM-4000 Language Master.....\$193.50

The LM4000 has more than 83,000 words from Merriam-Webster's dictionary with 274,000 definitions & Thesaurus with 487,000 synonyms Has SAT Tutor, SAT Word list. A speaking Dictionary



PRINTERS

OKIDATA

- OKIDATA® ML320.....\$313.50
- OKIDATA ML321.....\$437.50
- OKIDATA ML390 Plus-24 w/re.....\$438.50
- OKIDATA ML393 Plus-24 w/re.....\$918.50
- OKILASER™ OL400P.....\$625 50
- OKILASER™ OL820.....\$1,248 50
- OKILASER™ OL840 Postscript.....\$1,894.50

NEC SILENTWRITER 2 LASERS

- Model 90 Postscript, 6PPM.....\$1,579.50
- Model LC290M, Postscript, 8PPM.....\$2,379 50
- Model LC890XL, Postscript, 8PPM.....\$3,769 50

QMS LASERS

- PS410 Postscript,
- 4PPM/16 67 MHZ controller.....\$1,969.50
- PS815 Postscript
- 8PPM/20 MHZ controller.....\$3,547.50
- PS825 Postscript,
- 8PPM/20 MHZ, Dual letter tray.....\$4,197.50

TEXAS INSTRUMENTS

- MicroLaser Basic, 6PPM, Putty (HPII).....\$895.50
- MicroLaser PS17 Fonts, 6PPM, Putty.....\$1,219 50
- MicroLaser PS35 Fonts, 6PPM, Putty.....\$1,515.50
- MicroLaser XLBasic,
- 16PPM, Putty (HPII).....\$2,127.50
- MicroLaser XLPS
- 35 Fonts, 16PPM, Putty.....\$2,755.50

intel Math-Coprocessors:

- 80287-XL/XLT.....\$84.50
- 80387SX-16.....\$124.50
- 80387SX-20.....\$134.50
- 80387-DX16/DX23.....\$206.50
- 80387-0/DX25/DX33.....\$206.50

intel Modems

- Modem 2400 internal.....\$139.50
- Modem 2400 external.....\$167.50
- Modem 2400 external MNP.....\$216.50
- Modem 9600 external.....\$493.50

Hayes Modems

- 2400 BPS Modem w/Prodigy.....\$109.50
- ULTRA 9600BPS external.....\$709.50

DRIVES

- 3.5" Floppy Disk Drive 1.44MB.....\$74.50
- 5.25" Floppy Disk Drive 1.2MB.....\$69.50
- 40MB IDE Hard Drive.....\$188.50
- 80MB IDE Hard Drive.....\$324.50
- 124MB IDE Hard Drive.....\$428.50
- 211MB IDE Hard Drive.....\$649.50
- 40MB AT Hard Drive ST251-1.....\$248.50
- 65MB RRL Hard Drive ST277R-1.....\$253.50
- 80MB AT Hard Drive ST4097.....\$544.50

NEC MONITORS

- NEC IIA.....\$448
- NEC 3D-S.....\$598
- NEC4D-S.....\$944
- NEC 5D.....\$2199



GoldStar

- GD VGA Color 1425 Plus.....\$274 00
- GD TTL Amber 1210A w/Tilt & Swivel.....\$89 00
- GD Mono VGA
- 1220W-640 X480 w/Tilt & Swivel.....\$124 00

DTK Super VGA Interlaced

- Color-1024 X768 w/Tilt & Swivel.....\$358 00
- Sony CPD1304 -Non Interlaced
- 14"-1024 X768 w/Tilt & Swivel.....\$599.00

VIDEO/DISPLAY CARDS

- ATI VGA Wonder -256K.....\$177 50
- ATI VGA Wonder -512K.....\$207 50
- NEC Graphics Engine 16.....\$588.50
- NEC Graphics Engine 256.....\$883.50
- Paradise VGA +.....\$125.50
- Paradise VGA +16.....\$148 50
- Paradise 6514/A.....\$451 50
- PTI223 Super VGA- 1MB.....\$184.50
- Video7 -1024- 256K expandable to 512K\$178 50
- Video7 -1024- 512K.....\$208 50

Altima NSX

- 386SX LAPTOP -20 MHZ
- 2MB RAM (Expandable to 8MB)
- 40MB Hard Drive
- Large 10.4" VGA Display
- Display VGA compatible
- CCFT backlit LCD
- 32 level gray scale

altima LSX

- 386SX NOTEBOOK -20 MHZ
- 1MB RAM expandable to 5MB
- 40MB Hard Drive
- Display VGA compatible
- CCFT backlit LCD
- 32 level gray scale
- RS232 serial port

- Only 9 3lbs
- MS DOS 4 01
- RS232 serial port
- Parallel port
- Full size Keyboard
- 2400 baud Fax/Modem
- One Year Warranty

\$2,549



- Carrying case, MS DOS 4.01
- Power management
- Internal Ni-Cad battery 2-3 hours
- AC power adapter/charger
- 110/220v, 50/60Hz
- Only 6.3lbs- 8.5 X 11" Footprint
- One Year Warranty

\$2,389



nabih's, inc.
COMPUTER SYSTEMS

Order line.

800-622-4407

Fax : 708-869-9630

Customer Service: 708-869-6140

SINCE 1972

515 Davis St, Evanston, IL 60201



- C.O.D. orders accepted
- Personal and Company Checks allow 2 weeks to clear.
- Stolen Credit cards security check
- Quantity Discount available
- Prices subject to change
- Cashiers checks, Money Orders and Credit cards ship immediately.
- Above prices are for Mail Order only

DISKETTES

PRINTERS

SONY

GENERIC

VERBATIM

3 1/2" DS/DD	57¢
Formatted	72¢
3 1/2" DS/HD	99¢
Formatted	\$1.24

5 1/4" DS/DD	30¢
5 1/4" DS/HD	41¢
3 1/2" DS/DD	43¢
3 1/2" DS/HD	71¢
QD 2040 1/4" Tape Cart.	\$13.07
QD 6150 1/4" Tape Cart.	\$18.04

5 1/4" DS/DD	37¢
Formatted	47¢
5 1/4" DS/HD	52¢
Formatted	77¢

MEGAsoft

(800) 222-0490

FAX (908) 462-5658

PO Box 6609 • Freehold, NJ 07728

Unlabeled Bulk. Sleeves & Labels included. Price/disk in lots of 300. Mix & Match any format or size. Tape price in bulk packs of 10.

CIRCLE 560 ON READER SERVICE CARD

- ◆ Colored Disks Add 5¢
- ◆ White Boxed 10 Pak Add 4¢
- ◆ \$3 Handling Fee/Order + Ship Charge
- ◆ VISA, MasterCard, & POs Accepted
- ◆ 100% Certified with Lifetime Warranty

SAVE ON HP!!

PointJet	\$650	LaserJet II, III	CALL
PointJet XL	\$1,375	LaserJet IID	\$1,395
DeskJet	CALL	7470 Plotter	\$395
DeskWriter	\$435	7440 Plotter	\$650
RuggedWriter	\$650	7475 Plotter	\$795
ScanJet	\$750	7550 Plotter	\$1,295

Call for other HP items not listed
All above equipment demo or used with warranty

LASER PRINTER MEMORY

	1MB	2MB	4MB
HP LaserJet II, IIP, III, IID	\$100	\$145	\$235
Panasonic 4420, 4450	\$125	\$175	\$265
Epson, Packard, Bell, Toshiba	\$125	\$175	\$265
IBM 4019, 4019E	\$125	\$175	\$265
TI Microline	\$110	\$215	\$395
Okidata 400, 800, 820	\$195	\$235	\$335
QMS PS-410	\$165	\$215	\$295

Postscript for HP \$325 TAX \$115
Call for Laser and DeskJet accessories price and availability subject to change

800 441-1491

COMPUTER BUSINESS MART, INC.

10215 Buena Vista • #A, San Jose, CA 92071
(619) 449-9040 • FAX (619) 449-7929
Purchasing (619) 449-7974

CIRCLE 565 ON READER SERVICE CARD

BUY A BETTER BULK DISKETTE

NAME BRAND BULK		LOW CITY
VERBATIM 5.25 DS/DD	5.25 HD	.28¢ .52¢
SONY 3.5 DS/DD	3.5 HD	.50¢ \$1.09

GENERIC		LOW CITY
5.25 DS/DD	5.25 HD	.24¢ .38¢
3.5 DS/DD	3.5 HD	.39¢ .79¢

800-356-2553

media source

FAX (404) 952-1432

CIRCLE 561 ON READER SERVICE CARD

EXPANSION UNITS

TERABYTE INTL

MOTHER BOARD		
386-33.64K CACHE/1MB		\$ 505.00
386-25.64K CACHE/1MB		\$ 515.00
386-33.128K CACHE/1MB EXPANDABLE TO 32MB		\$ 435.00
386-33.128K CACHE/1MB EXPANDABLE TO 32MB		\$1200.00
PARADOX 1024/768 w/ 256K VGA		\$ 5.00
"R" DE" 1024/768 w/ 256K VGA		\$105.00
SERIAL MOUSE		\$ 5.00
AT IDE 20 P.S. 100M * 100M/4		\$ 5.00
CAME CARD 2 LAMIN PORT		\$ 5.00
PRINT CARD 1 PRINT PORT		\$ 5.00
AT IDE TO HD CONTROLLER w/ CABLE		\$ 16.00
REMOVABLE HARD DISK DRIVE PAK		\$ 10.00
100% SECURITY DIFFERENTIAL DATA SHARING		\$105.00
FULL S/H CASE w/ 200W PS (340) 113.5		\$ 85.00
MED TOWER CASE w/ 200W PS (340) 113.5		\$105.00
H/H MAC ENCLOSURE w/ 200W PS		\$105.00

IBM PS/2 MEMORY		D-RAM-SIMM-SIPP	
1MB 4466003	\$ 85.00	1 MB 100 80	\$ 4.90
2MB 4466004	\$ 170.00	2MB 100 80	\$ 9.25
4MB 4466005	\$ 340.00	4MB 100 80	\$ 18.50
8MB 4466006	\$ 680.00	8MB 100 80	\$ 37.00
16MB 4466007	\$ 1360.00	16MB 100 80	\$ 74.00

ORDER 800-688-BYTE
TERABYTE INTL INC.
2010 MANHATTAN PLACE #116 TORRANCE CA 90501
TEL 713 787-9736 FAX 713 787-9735
PRICE SUBJECT TO CHANGE WITHOUT NOTICE

CIRCLE 563 ON READER SERVICE CARD

ICs PROMPT DELIVERY!!!

DYNAMIC RAM		
4M Board for hp LJ's w/ 2MB	\$125.00	
SIMM 4Mx8	80 ns	180.00
SIMM 1Mx8	80 ns	57.00
SIMM 1Mx8	80 ns	46.00
4 Mbit	80 ns	25.00
4 Mbit	80 ns	34.00
1 Mbit	80 ns	4.95
41256	256Kx1	100 ns 1.90
41256	256Kx1	120 ns 1.60
44256	256Kx4	80 ns 5.75
4484	64Kx4	100 ns 1.75
27C4001	512Kx8	150 ns \$38.00
D28F010	128Kx8	150 ns 24.00
27C1000	128Kx8	150 ns 13.95
27C512	64Kx8	120 ns 7.25
27128	16Kx8	250 ns 3.40
STATIC RAM		
1 Mbit	128Kx8	100 ns \$13.00
62256LP	32Kx8	100 ns 6.50

OPEN 9 DAYS 7 AM-6 PM SHIP VIA FED-EX ON SAT
SAT DEL ON
FED-EX ORDER
RECEIVED BY
NO LATE DELIVERY
P.O. #1708 10/13
FED-EX C.O. #108

CIRCLE 564 ON READER SERVICE CARD

Did you know...

On average, PC Magazine's direct market purchasers have spent—
• \$30,000 on hardware
• \$5,400 on software
• \$2,100 on accessories
• an average of \$2,855 per order

Get all the facts. Call your PC Magazine Marketplace Account Representative to place your ad, 212-503-5115 or 800-825-4237.

CALL DRAM CO

- Your PC Magazine memory source for 4 years
- 1 Yr Warranty on Parts
- Parts New & Guaranteed
- Prices Subject to Change

COD

- Prices listed include 2.5% discount for cash
- COD Cash Co. Chk. OAC
- PO's Accepted from Govt & Qualified Co's

CHIP HOTLINE
1(800) 488-DRAM

Tech Supp (415) 398-4714
Tel (415) 398-2987
Fax (415) 398-5402

CALL DRAM COMPANY
P.O. Box 590127
San Francisco, CA 94159

DRAMs		
1MB X 1 80NS		\$ 4.85
1MB X 1 70NS		\$ 5.15
1MB X 1 60NS		\$ 5.75
256K X 4 80NS		\$ 5.25
256K X 1 100NS		\$ 1.75
256K X 1 80NS		\$ 1.90
64K X 4 80NS		\$ 2.25
*Call for prices on others		
SIMMS/SIPPS		
IBM TYPE SIMMS		
4MB X 9 80NS		\$175.00
1MB X 9 80NS		\$ 44.00
1MB X 9 70NS		\$ 46.00
1MB X 9 60NS		\$ 53.00
256K X 9 80NS		\$ 15.00
*Please Add \$2 For SIPPS		
APPLE TYPE SIMMS		
4MB X 8 80NS		\$170.00
1MB X 8 80NS		\$ 41.00
SUN SYSTEM TYPE SIMMS		
4MB Kit		\$295.00
16MB Kit		\$995.00

PS/2 UPGRADES		
30/286 Exp. Bld #1497259		
512K Kit 30F5348	\$ 35.00	
2MB Kit 30F5360	\$129.00	
70 E61 121 502 55SX 65SX		
1MB 6450603	\$ 65.00	
2MB 6450604	\$110.00	
55SX 65SX 34F307 34F3011		
4MB 34F2933	\$279.00	
Model 70 A21		
2MB 6450608	\$120.00	
Model 80		
1 2 MB	\$ Call	
Model 90 95 P75		
2MB 6450902	\$175.00	
4MB 6450128	\$375.00	
Exp Bld 50 502 55SX 60 65SX		
2 8MB w/2MB	\$375.00	
2 16MB w/2MB	\$425.00	
Exp Bld All Models 70 & 80		
2-14MB w/2MB	\$395.00	
4-16MB w/4MB	\$775.00	

LAP/PORT UPGRADES		
TOSHIBA		
T1000	\$ Call	
T3100F	2MB \$ 155	
T3100SX	2MB \$ 139	
	4MB \$ 349	
T3200SX	2MB \$ 139	
	4MB \$ 349	
15200 18500 2MB	\$ 149	
	8MB \$ 779	
COMPAQ		
Port 386-20 1MB	\$ 199	
LTF 286	1MB \$ 99	
	2MB \$ 149	
	3MB \$ 559	
LTF 386S-20 1MB	\$ 269	
	4MB \$ 299	
SLT 286	1MB \$ 129	
	4MB \$ 575	
SLT 386	1MB \$ 129	
	4MB \$ 575	
ZENITH DATA SYS	\$ Call	
NEC PROSPEED	\$ Call	

DESKTOP UPGRADES		
COMPAQ DESKPRO		
286 386-20 20E 25		
1MB 113131 001	\$ 85	
4MB 113132 001	\$249	
386 16		
1MB 113646 001	\$ 95	
4MB 12534 001	\$275	
286 386 386SX 2C		
1MB 118688 001	\$ 75	
2MB 118689 001	\$135	
4MB 118690 001	\$335	
386 33 486 33 SysPro		
2MB 115144 001	\$145	
8MB 115651 001	\$799	
AST		
Premium 386 386 16		
1MB 500510 001	\$ 75	
4MB 500510 008	\$209	
Premium 386 20		
1MB 500510 003	\$ 95	
4MB 500510 004	\$259	
H-P VECTRA	\$ Call	
NEC POWERMATE	\$ Call	

LASER PRINTR UPGRADES		
HP II, IIO, IIP, III, IID		
1MB	\$ 95	
2MB	\$135	
4MB	\$215	
PANASONIC 4420, 4450		
1MB	\$115	
2MB	\$155	
4MB	\$235	
IBM 4019, 4019E		
1MB	\$115	
2MB	\$155	
3 MB	\$235	
CANON, OKI, TI	\$ Call	
MATH CO'S		
INTEL 80287	\$ Call	
INTEL 80387	\$ Call	
CYRIX 83587 16SX	\$ 126	
20SX	\$ 148	
CYRIX 83D87-16DX	\$ 198	
-20DX	\$ 198	
-25DX	\$ 198	
-33DX	\$ 210	

CIRCLE 562 ON READER SERVICE CARD

Calling about an ad? Say you saw it in **PC Magazine Classified**

Printer Enhancements for Most Laser Printers.

Call the Laser Printer Specialists.

We Know What We Sell!



PACIFIC DATA ENHANCEMENTS

25 In One	Lowest Price
Pacific Data's best-seller. 172 Fonts & symbol sets.	
PacificPage for LJII bundled w/2MB memory.	\$359
PacificPage P.E.	\$349
The fastest PostScript emul. cartridge available	
For LJII/D/P, LJIII/D/P	\$349
For Macintosh	\$499
PacificPage XL	CALL
Accelerator only	\$489
For Macintosh	\$929
Pacific Type 40 add. fonts for the P.E.	\$269
Pacific BarCode	\$309
Pacific Font Bank	Call
Pacific Connect	\$289
Complete Font Library	\$259

51 scalable outline type styles

EXPANDABLE MEMORY BOARD

User upgradeable by adding DIP DRAMS

	LJII/D	LJII/D/P
0MB	Call	Call
1MB	\$128	\$128
2MB	\$159	\$159
4MB	\$259	\$259



LP Memory for IBM 4019/4019E **Call**
Memory boards available for all these printers.
Epson EPL 6000, Toshiba page L6, AT&T 593, MT905, Packard Bell 9500 & PB-9600, Panasonic KX-P4420 & KX-P44501, Mannesmann Tally 905, Facit P6060, OKILASER 400, OKILASER 800, QMS-PS410, Brother HL-4, TI microLaser/ microLaser PS.

SOFTWARE

Pacific Print	\$295
Supports Pacific Data's emulation cart. on Novel LAN. Complete que control	
PrintCache (Laser Torq)	\$99
Fastest print buffering product available	
Print A Plot 1.0/2.0	\$169/\$209
HPGL software emulation. Version 2.0 w/tiling capability	
LaserControl	\$129
Lets almost any software make full use of your laser printer	
MacPrint	\$129
Makes MAC. 100% compatible with HP LJ printer	

HARDWARE & ACCESSORIES

LJII/D/Legal Tray	\$59
LJII/D/Envelope Tray	\$72
LJ IIP Lower Letter Cass.	Call
BigBin	
Comp with all Canon SX Engine printers inc. HP LJII/D	
1500 Sheets capacity	\$469
250 envelope capacity	\$399

IQ ENGINEERING SUPER CARTRIDGES

SC1 55-Fonts, for all HP LJ Printers	\$259
SC 2WP -Trms Rmn/Helv. from 8 to 24 pts.	\$229
SC 2 17 Typefaces w/Fonts from 4 to 30 pts	\$349
SC 2XP -Over 200 fonts from 4 to 30 pts.	\$539
SC 2L+ -Same as SC2 in landscape format.	\$349
SC2LS -Most wanted landscape font to 30pts	\$289
SC 3-LJIII Postscript fonts	\$309

ADOBE

Complete Adobe product line available	
PostScript Cartridge From Adobe	
Fastest cartridge for LJ II	Call
Adobe Type Cartridge 1 & 2	Call
Each with at least 25 Adobe PostScript typefaces	
Adobe Illustrator	\$278
Streamline Windows	\$228
Adobe Type Library	Lowest Prices
Entire font library available for both MAC & PC	
Adobe Type Manager	Lowest Price
Real time printer & screen fonts scaling under windows 3.0	
Adobe Type Manager Plus Pak	\$109
Complements ATM with 22 additional PostScript language outline fonts resident in most PostScript printers from Adobe	
Adobe Type Align	\$67
Typed text follows any line, freehand, curve or oval. Complements ATM under Windows 3.0.	
Publishing Pack	\$269
Collection of typefaces selected to work especially well together in particular applications. Three packs to choose from; Newsletters, Forms and Schedules, and Presentations.	
Adobe Type Set 1/2	\$57
Adobe Type Set 3	\$117

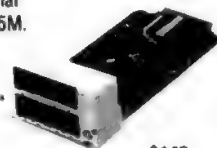


ENHANCEMENTS FOR DESKJET PLUS & DESKJET 500

No need for a dozen font cartridges. Two cartridges access hi-quality fonts for less	
Elefont Desk Cartridge	\$159
Four typefaces from 5 to 16 pt.	
Elefont Headline Cartridge	\$159
Three typefaces in 11, 15, 22, and 30 pt. incl. scientific symbols	
Desk + Headline (bundled)	\$199
Memory Cartridge - 256K	\$129
SC DJ/500 Standard/Pro	\$139/\$169
SC DJ/Plus Standard/Pro	\$139/\$169
Professional addition includes headline cart.	

PRINTER SHARING DEVICES

Family of plug-in sharing boards	
Model 80	\$369
Now at 115K baud. 8 serial w/256K exp. to 512K/1.25M.	
Model 50	\$289
4 ser. & 1 para. Same mem. model 80, 115K baud	
Model S4	\$149
4 serial automatic. Serial speed up to 115K baud	



MISCELLANEOUS CARTRIDGES

A wide variety of multiple fonts and special cartridges available. Full font customization offered. Complete HP compatible font cartridges in stock. From C01 to C08.	
123/Spreadsheet Cartridge	\$149
Ideal cartridge for spreadsheets. Up to 30 CPI.	
Pro Collection Turbo Cartridge	\$179
65 Fonts 100% equivalent to HP's	
Tax & Finance (T)	
For all tax preparation programs inc. Center Piece Software Fully compatible with AT&T cartridge.	

Featured Special!



JetFax II
Use your laser printer to get faxes on plain bond paper with JetFax. Send PC files as faxes from within your applications. No need for fax boards. JetFax provides low cost faxing capability to LAN or switchbox users.

Call for price.

DH

systems

1940 Cotner Ave. · Los Angeles, CA 90025
FAX: (213) 478-4770 · Phone: (213) 479-4477

For Printer Products and Additional Information, Call

1-800-747-HPLJ

1-800-747-4755

*Ask About Our Low Price Guarantee!



NO SURCHARGE FOR CREDIT CARDS · IMMEDIATE SHIPMENT ON APPROVED PURCHASE ORDERS · 30 DAY MONEY BACK GUARANTEE-Except for opened software-Does not include return freight or shipping & handling. All returned merchandise must be accompanied by a return material authorization (RMA) number. Prices are subject to change without notice. *Every reasonable competitive price will be met!

CIRCLE 566 ON READER SERVICE CARD

TAPE DRIVE SUBSYSTEMS

ACCOUNTING

9-Track Tape Subsystem



Now you can exchange data files between your IBM PC/XT/AT and any mainframe or mini-computer using IBM compatible 1600 or 6250 BPI 9-Track tape. Unit can also be used for disk backup. Transfer rate is up to 4 megabytes per minute on PCs and compatibles. Subsystems include 7" or 10 1/2" streaming tape drive, tape coupler card, cables and software.

QUALSTAR

9621 Irondale Avenue
Chatsworth, CA 91311
Telephone: (818) 882-5822

CIRCLE 567 ON READER SERVICE CARD

SAVE ON 9 TRACK TAPE SYSTEM

FOR IBM PC/XT/AT
286/386/486



- Mainframe to PC Data Transfer
- High Speed Backup
- All Software, Complete System
- Service and Support, Easy Installation

call (919) 763-8400 or write to:
CONTECH Computer Corp.
P.O. Box 7368 Wilmington, NC 28408

CONTECH

CIRCLE 568 ON READER SERVICE CARD

SOFTWARE/ ACCOUNTING

MIP Fund Accounting System

Simply the best software for non-profit & governmental organizations since 1982.

Flexible Chart of Accounts • Automatic Offset & Interfund Balancing • Automatic Cost Allocations • Monthly Budgeting & Forecasting • Check, P.O., & A/R Bill Printing • Multiple Funds • Multiple Overlapping Fiscal Years • User Defined Reports • IBM PC/XT/AT Compatible • Single User or Network • User Installable

Modules: General Ledger, Budget Reporting, Accounts Payable, Encumbrances, Accounts Receivable, Database Interface, Payroll, Fixed Assets

1-800-647-3863

505 East Huntland Drive, Suite 340, Austin, TX 78752

COMMUNICATIONS

DATA ENTRY

MULTI-LINE PC-DOS BBS

The Bread Board System (TBBS) Secure reliable, full featured commercial Information system for IBM and compatibles. Menu editor allows customization by nonprogrammers. Kermit, X, Y & Z-Modem. High performance allows up to 64 simultaneous callers. Up to 38,400bps dBASE module available.

eSoft, Inc.
15200 E. Girard Ave. #2550
Aurora, CO 80014
(303) 699-6565

DATA ENTRY

Replace dedicated data input systems
Front-end mainframe applications

KeyEntry III

- ✓ LAN or stand-alone environments
- ✓ ScreenPainter and MenuManager included
- ✓ Batch Control System and Reformat utility
- ✓ Spanish, German, and French versions
- ✓ Outstanding customer support
- ✓ Thousands of users worldwide
- ✓ OS/2 version

800-533-6879



FREE DEMO DISK
AVAILABLE TO
QUALIFIED COMPANIES



SOUTHERN COMPUTER SYSTEMS, INC.
(205) 251-2985 • FAX: (205) 322-4851
In UK: SCS Europe, Ltd. 0753-36550/FAX 0753-36765

Did you know...

PC Magazine Classified generated a whopping \$200 million in annual sales revenue for its advertisers, resulting in these expenditures—

- Over \$52 million in applications software
- Over \$52 million in computer systems
- Over \$22 million in supplies
- Over \$12 million in systems
- Over \$61 million in peripherals
- Over \$500,000 in consulting services
- Over \$8.9 million in other computer products and services

Tear into a test drive of our most popular accounting software for \$19.95. **BusinessWorks** handles everything from General Ledger, Receivables & Payables to Inventory & Payroll. Quickly. Efficiently. Painlessly.

1-800-447-5700

*BusinessWorks, Winner of
PC World's Best Buy and
InfoWorld's Best In
It's Class Awards.
Get It!*



CIRCLE 569 ON READER SERVICE CARD

dBASE ACCOUNTING TOOLS

- *General Ledger
- *d/invoice & A/R
- *Service Billing
- *Job Costing
- *Purch Ord./Inventory
- *Bill of Materials
- *Accts Payable
- *Sales Analysis
- *Order Entry
- *Job Estimating
- *Payroll
- *Lazr-Forms

\$99 ea + s&h w/dBASE 3+ or 4 Source Code
DATAMAR SYSTEMS
8586 Miramar Place
San Diego, CA 92121
(619) 452-0044 MC, Visa, AX, CH, COD

DATA ENTRY SOFTWARE

HEADS-DOWN data entry and TWO-PASS verification. Fast and powerful, of course, but more importantly, *extremely easy to use*. Paint the screen formatting in minutes. On-line help text, edit language, batch control.

PC from \$395
Also for LAN's.
IBM AS/400™
IBM S/36

FREE Trial

206/776-6443
800/356-0203



COMPUTER KEYES
21929 Mokah Rd.
Woodway, WA 98020

DATA ENTRY

Why have over 85% of the largest companies in the U.S. selected the **RODE/PC Data Entry System?**

The answer will be obvious when you call for information and a free demonstration today.
(415) 323-8195



DPX • 45d California Avenue
Palo Alto, CA 94306

CIRCLE 570 ON READER SERVICE CARD

Classified Advertising
Information
(800) 825-4237

VIKING DATA ENTRY

Professional Quality Software

- Used by U.S. Census
- Advanced validation
- Sequential/ISAM files
- MS/DOS, UNIX, XENIX, VMS, AIX
- Technical support
- Re-key verify

Viking Software Services
4808 E. 67th St., Ste 100
Tulsa, OK 74136
918/491-6144 FAX 918/494-2701

Did you know...

83% of PC Magazine's subscribers have purchased or authorized the purchase of PC products from direct marketers in the last 12 months.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

EDUCATION

ENTERTAINMENT/GAMES

Version 1.20 now shipping!
Millennium Puts today's headlines in historical perspective...
 A complete graphic guide to the history of Europe and the Middle East from 1000 AD to the present. Maps are scalable and change continuously from year to year. Print to laser or dot-matrix printers. Export maps in TIFF or PCX format. Includes descriptive text narrations linked to map.
Clockwork Software
 P.O. Box 14006, Chicago, IL 60614 USA (312) 281-3132
 CIRCLE 571 ON READER SERVICE CARD

ENGINEERING

SIMULATION

GPSS/PC is a full-power version of GPSS, the most popular mainframe simulation language. Specifically designed for interactive use on today's high-speed microprocessors, it is loaded with features such as interactive graphics and animation. Using GPSS/PC, you can predict the behavior of complicated real world systems.
MINUTEMAN SOFTWARE
 P.O. Box 171/B
 Stow, MA 01775
 800-223-1430/508-897-5662 Ext 316

To place your ad in

PC MAGAZINE CLASSIFIED

Call (212) 503-5115
 or (800) 825-4237

ENTERTAINMENT/GAMES

Swimsuit Calendars

DON'T SETTLE FOR LESS WHEN YOU CAN HAVE THE BEST

- Special Holiday Offer
- Super VGA 800x600 PCX Images
- Ideal for Windows Wallpaper
- Makes A Great Gift

Only \$29.88, each additional purchase \$24.88



#904 Lovely Ladies
This year add some spice to an ordinary computer. Every month is a treat

DOS & Windows viewers included
 Comes on 9 high density disks
 Hard drive not required

24 hour / 7 days
 To order call
800-354-5353
 US and Canada

Add \$3 for S&H
 Add \$3 for Foreign
 Add \$3 for 3.5" disks
 FL add 6% sales tax

Send check or money order to:
Starware Publishing Corp.
 P.O. Box 4186, Dept. 23
 Deerfield Beach, FL 33442



#905 Hot Hunks
These hot hunks are sure to inspire you to new heights every month

CIRCLE 574 ON READER SERVICE CARD



SeXXy Software

Connoisseur Collection
ALL NEW! In 256 Color VGA!!
SeXXy Disk #CC1 - ★ YOU BE THE STAR ★
 The FIRST CUSTOMIZABLE movie allows you to write the dialog and the title. You can star with the partner of your choice. Incredible scenes display with your dialog. ONLY AVAILABLE FROM US!
SeXXy Disk #CC2 - THE FIRST SOUND MOVIE!
 The first computer erotic movie with SOUND. See the incredible 256 color VGA graphics while hearing the actual dialog. OURS EXCLUSIVELY!
SeXXy Disk #CC3 - THE BEST MOVIE!
 The best computer movie available. Only for the serious collector. 256 stunning VGA colors.
1 Movie \$29, 2 Movies \$49, 3 Movies \$65
All CC Disks Require VGA monitor and hard disk - over 1 MB of action.

SeXXcapades - The first adult game with TRUE SOUND and 80 sizzling 256 color VGA scenes!
 • Sexual preference and foreplay options - Play with 7-8 close friends - Over 5MB of pure action!
 • Fulfill your sexual desires with new experiences - Find out how your partner would really like to make love
\$79 - Special offer: \$69 with purchase of any CC disk above - OURS EXCLUSIVELY!
 ADD \$3 S/H • 3.5" OR FOREIGN ORDERS ADD \$2 PER DISK • IN PA ADD TAX
VISA/MC Orders only 800-243-1515 Ext. 600CH
 24 HRS. 7 DAYS • Or check MO to SeXXy Software 2880 Bergey Rd. Dept 600CH, Hatfield PA 19440

Must Have Age Over 21

SeXXy Disk #1 - An unbelievable visual erotic encounter - MUST SEE!
SeXXy Disk #2 - NEW! 3 Erotic encounter games for friends and lovers guaranteed to shed both clothes and inhibitions.
SeXXy Disk #3 - An anatomical arcade game with unusual ammunition.
SeXXy Disk #4 - 2 more incredible visual erotic encounters - impress your friends.
SeXXy Disk #5 - Create your own erotic fantasies about friends and lovers.
SeXXy Disk #6 - NEW! View print or edit ten sizzling pictures including celebrities.
\$7 each, any 3 for \$17, or all 6 for \$32.
 for IBM & compat CGA, EGA or VGA graphics req'd.

CIRCLE 572 ON READER SERVICE CARD

Adult VGA Software

Visualize the full potential of VGA and SVGA.

Hi-res, 256 color images.

Vol. 1 Sexy (6 disks per vol.)	\$13.95
Vol. 2 Nude	\$13.95
Vol. 3 More Nude	\$13.95
Vol. 4 Adults Only	\$13.95

Hi-res VGA animation. Just like the movies!!!

Vol. 5 Adult VGA Movies	\$13.95
Vol. 11 Hot Italian Movies	\$13.95
Vol. 12 Long Length Movies	\$13.95

Special: Order 4 volumes, select 5th free!
 Choose from six 5 1/4" DD disks, three 5 1/4" HD (best deal), three 3 1/2" DD, or two 3 1/2" HD for each vol. All disks are full. Vol. 12 available in only HD disks.

Get more great software for less. Guaranteed. Fast service. Order today include \$3 S&H. Must state age 21 or over. Send check or MO to:

CJWare
 MC/VISA orders or free Dept. M, P.O. Box 36
 catalog call (309) 452-7700. Normal, IL 61761

CIRCLE 573 ON READER SERVICE CARD

Calling about an ad?
 Say you saw it in
PC Magazine Classified

Did you know...

On average, PC Magazine's direct market purchasers have spent-

- \$30,000 on hardware
- \$5,400 on software
- \$2,100 on accessories
- an average of \$2,855 per order

Where Adults Come To Play!

ODYSSEY BBS

- Large Numbers Gaming, S.O.S. Games
- CR/Style Group and Private Chat
- 1000's of Shareware Programs
- Giant Message Forums
- Matchmaker Dating Database

FOR FREE DEMO AND LOCAL NUMBER CALL
818-358-6968
 BY MODEM, MUST BE OVER 18 3/12/2400.B/W/I

CIRCLE 575 ON READER SERVICE CARD

XXX-RATED CD-ROM

THE BEST VALUE IN ADULT SOFTWARE
 \$500 of VGA movies & images for only

\$59.88

For ordering information refer to the "1992 Swimsuit Calendars" advertisement in this section of the magazine.
 Only From Starware Publishing Corporation

CIRCLE 576 ON READER SERVICE CARD

FINANCIAL

CAPTOOL®

"For its price, Captool, from Techserve, is the best portfolio manager you can buy."
 PC Computing 12/89

TECHSERVE, Inc. Box 70056, Bellevue, WA 98007
1-800-826-8082

CIRCLE 577 ON READER SERVICE CARD

Super Portfolio Manager

- Stocks Bonds Mut. funds etc.
- Before/After tax ROI/IRR calcs
- Spec. Avg. Fido/Life tax lots
- Price downloads, mvg avg plots
- Bond swaps, YTM/YTC calcs
- 24+ reports, graphics & more

\$99 Chk/Visa/MC \$4 S&H

PC Magazine is exclusively read by over 800,000 business buyers and brand specifiers, including computer resellers and consultants.

Get all the facts. Call your PC Magazine Marketplace Account Representative for more information or to place your ad, 212-503-5115 or 800-825-4237.

FOREIGN LANGUAGES

Diplomat Software
Alphabets Of The World For Your PC
By Peter Appleton



Series of 36 alphabets providing both English and foreign characters for screen, keyboard and printer support while using existing software WordPerfect, Word, WordStar, Quattro Pro, Ventura Publisher, Works, dBase - more.

Diplomat Software
3700 Campus Drive, Suite 202 Newport Beach, CA 92660
Phone (714) 674-0888, Fax (714) 250-8117

Starter Package \$125
Ventura Support \$25
PageMaker Support \$25
PerfectWord Support \$25
LaserWriter \$75
LaserWriter is sold only with purchase of Starter package or Support package. \$5.50 per page. VISA, MC, check. COD (US only add \$5). CA residents add 8.75% tax.

CIRCLE 578 ON READER SERVICE CARD

GRAPHICS

COMPUTER IMAGES



Super VGA
Also VGA/EGA/MCG/CGA and Animation
1024 x 768 x 256
Photographic Quality Real Color Images
ASTRONOMY • NATURE • SCENIC
FULL COLOR VIDEO MOVIES
HUGE ADULT SECTION • HEAVENLY BODIES
You must be at least 21 for adult movies.

Now you can experience your computer's maximum graphics ability!
GIF images for IBM, MAC II, Amiga, Atari and most other computers in our favorite GIF resolutions: EGA to VGA, 320x200x256 to SVGA, 1024x768x256 and all resolutions between.

TWO WAYS TO BUY OUR IMAGES

32 line BBS, 503-697-5100 • You'll have full unlimited access to 1400+ megabytes of images and programs on our 24-hour, 2-line BBS. Only \$10/hr., no uploading required, no time limits. No charge to look around. Call for WFT head numbers.

Must be 21 for adult areas. Buy time online with credit card on the world's largest Online Graphics System!

CATALOG MAIL ORDER: 503-697-7700
Save long distance phone charges. Under anything found online through our Mail Order Catalog. World wide shipment. Credit card, cash, check. Same day shipment. US Mail 1-PS 1343X, any where.

Event Horizons
311 B Ave
Suite 209
Lake Oswego, OR 97034
Information 503-697-7700

CIRCLE 579 ON READER SERVICE CARD

Calling about an ad?

Say you saw it in
PC Magazine Classified

MAILING PROGRAMS

ANNO UNO THE NEW
LABEL PEELER
FROM EXPRESS LABEL



\$39.95

DISPENSES STANDARD 15.16 X 3.12 LABEL
EASY TO USE

• Mailings
• Mailing Lists
• Mailing Address
• Mailing Labels

1-800-EX-LABEL
(800) 253-5267 ext. 400-545-2237
30 DAY MONEY BACK GUARANTEE
N.Y. & N.J. add \$3.00 S.H. & P.

CIRCLE 580 ON READER SERVICE CARD

MAIL ORDER MANAGER (M.O.M.)
The complete solution for the mail order business—order entry-review, credit card processing, UPS manifesting, profit analysis, accounting. Clipper compiled, dBase III+ files. Inbound/Outbound Editor's Choice—find out why more people buy M.O.M. after comparing Single Station and Network Systems. Dyadcomp Development Corporation
P.O. Box 641
Wayne, NJ 07470
(201) 694-0779

The Mail Order Wizard
Complete management system for a catalog, inbound telemarketing, or mail order company. Order processing, inventory mgt, ad forecasting, sales/banking, list mgt, modem charge approval, EDC, UPS manifest w/scale. Single and MultiUser systems. Inbound/Outbound Editor's Choice!
The Haven Corporation
802 Madison St., Dept. M491
Evanston, IL 60202
800/782-8278, 708/869-3434

Today's PC Mail System
Fast! Accurate! Large volume mailers use PostWare software programs to: standardize & correct addresses; add ZIP, ZIP+4, Car.Rt. presort 1/2/3 Class; detect duplicates; print Postnet bar codes; palletize 2/3 Class; and qualify for postal discounts. CASS certified. Reported throughputs over 100,000/hr.
Postalsoft, Inc.
4439 Mormon Coulee Rd.
La Crosse, WI 54601-8231
608/788-8700 (WI) or 800/831-6245

MUSIC

SONGWRITING V MUSIC PROCESSOR
Prints professional sheet music, songs, scores with text, chords, dynamics. Compose, edit, record, play, transpose, copy, extract, import, publish - all in standard notation. Symbol editor/librarian. PC, MIDI or SMF entry & playback. Matrix/laser printers. \$99.95 + \$5 s/h. Free sample output
SONGWRITING SOFTWARE
7 Loudoun Street, S.E., Suite 5A
Leesburg, VA 22075
1 (800) 877-8070 (703) 777-7232

MUSIC

Recording Studio in a PC? Piece of Cake.

Cakewalk, the 256-track MIDI sequencer, lets you record, edit, and play back music using a MIDI-compatible instrument. Designed for both musicians and PC hobbyists alike. It's a PC Magazine Editor's Choice! The #1-selling MIDI sequencer for the IBM PC. Only \$150.

Twelve Tone
Get a Piece.
Call 800-234-1171 and ask for our free catalog. Full line of MIDI software and interfaces available.

P.O. Box 760, Watertown, MA 02172 (617) 273-4437
CIRCLE 581 ON READER SERVICE CARD

PUT AN AUTOMATIC JAZZ/ROCK COMBO IN YOUR PC
BAND-IN-A-BOX™

for Soundblaster Adlib or MPU 401 - Version 4

Creates music minus one accompaniments for virtually any song any style. You simply type in the chords, pick a tempo & one of 24 styles, and the program creates neatly embellished chords, a bass part, and drums to be played on a MIDI synthesizer.

PC MAGAZINE Technical Excellence Awards Jan 91

TO ORDER: 416-528-4897
Demo line 416-528-5268
PG Music Inc. 111 266 Elmwood Ave
Buffalo NY 14222 \$35.00 S.H.
VISA • MASTERCARD

1990 FINALIST
Band - a Box
The House of Cards

Requires 640K PC, SoundBlaster or Adlib card or MIDI system through MPU 401 interface

CIRCLE 582 ON READER SERVICE CARD

PREVENTIVE MAINTENANCE

MAINTENANCE & INSPECTION
An easy-to-use computerized method to organize, operate, and control an effective preventive maintenance system. Applicable to any type of business or industry. Full screen input and displays, plus function key help command. Maintains historical data, creates work orders, and provides numerous reports. For info, write to
PENGUIN COMPUTER CONSULTANTS
P.O. Box 20485
San Jose, CA 95160
(408) 997-7703 FAX: 408-927-0570

PROGRAMMERS TOOLS

Are You Running DOS, Or Is DOS Running You?

Tired of the limitations of standard DOS commands? Get **InCommand™** powerful enhancements to the DOS commands you already know, and beat the DOS runaround!

All Commands Have Unmatched File Selection!
Multiple file and directory wildcards. Select files before, after or on any date/time, bigger or smaller than any size, with or without any attributes. Exclude files matching a pattern. Process entire directory trees as easily as one file.

Total File Management
Runs from the DOS prompt. No menus to slow you down.

NEW! Text Search: full screen browse, and line model!
• Directory: sort by name, extension, time, or size, subdirs
• Copy: multi-copy incremental backups, listdir directory trees. Up to 40% faster to foppies than XCOPY.
• Move/Rename: files, dirs, or entire trees without copying
• Execute: run your own programs and batch files as if they had all of these file selection capabilities
• Delete: files, directories, and entire directory trees
• Fast on-line help, at your fingertips
• Network compatible

Much more, only \$80!
Call now for demo disk.
No matter what DOS you use, 3.0, 3.1, even DR DOS, you need to get InCommand.

Inductive Logic
P.O. Box 28238
San Diego, CA 92196
(619) 578-5148

Intelligent Software for Every User

CIRCLE 583 ON READER SERVICE CARD

PUBLIC DOMAIN/SHAREWARE

PSL News

The Only Major Monthly Publication about Shareware.

Do yourself and your company a favor and subscribe to this gem. Pays for itself in software discoveries. - John Dvorak, PC Magazine

Call for a free sample issue:
800-242-PSL 713-524-6394

Member - ASP

CIRCLE 584 ON READER SERVICE CARD

SOFTSHOPPE, INC.
ASP Member

■ Selected Programs
■ Latest Versions
■ As Low as \$1.50

FREE CATALOG
IBM PD/SHAREWARE
POB 3678, Ann Arbor MI 48106

Call 800-829-BEST (2378)
or 313-761-7638
Fax 313-761-7639

CIRCLE 585 ON READER SERVICE CARD

MORE BYTES FOR THE \$\$\$
HUNDREDS of NEW Shareware/PD programs in our NEW FREE Fall '91 catalog!!! Get only the BEST for your money. We have one of the largest QUALITY libraries in the country. Our 80+ page detailed catalog gives specific info on each program. Call Toll Free! MC/VISA
BIG BYTE SOFTWARE
P.O. Box 14008
ARLINGTON, TX 76094-1008
1-800-879-BYTE (24 hrs)

Classified Advertising
Information
(800) 825-4237

RELIGION

CHURCH SOFTWARE

Discover for yourself why more churches are choosing **Power Church Plus.**
Try out the leading membership and accounting package
Call today for your **FREE** full-working DEMO.
F1 SOFTWARE, 6300 Variel Avenue, Suite H, Woodland Hills, CA 91367
(800) 486-1800 (818) 868-1800

CIRCLE 586 ON READER SERVICE CARD

SECURITY

STOP SOFTWARE PIRACY

Developers Say...

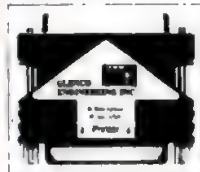
"Since the Hardlock uses an algorithmic response chip, I am assured of the highest level of protection. Also, the optional programmable memory means I can keep custom configurations in Hardlock. I can protect my .EXE or .COM files directly and/or incorporate Glenco's high level language interface routines into my software."

Accountants Say...

"Since our software can't be copied, our revenue has steadily increased. The unique programming board allows us to program the Hardlock in seconds. This ensures optimum delivery schedules from Glenco and a lower inventory cost for us. Hardlock's field programmable feature means a single Hardlock can protect more than one product."

End Users Say...

"Hardlock allows me to backup my software investment. I just plugged Hardlock into the printer card, connected the printer cable, and forgot about it."



Hardlock
Programmable, algorithmic
response and memory
option — all in one

Call for information
on our disk-based systems.

GLENCO

ENGINEERING INC.

SEVERING THE SOFTWARE INDUSTRY SINCE 1979

270 Lexington Drive
Buffalo Grove
Illinois 60089-6930
(708) 808-0300
FAX 808-0313
1-800-562-2543

CIRCLE 587 ON READER SERVICE CARD

H A R D L O C K

BIT-LOCK™ SECURITY

Piracy SURVIVAL 8 YEARS proves effectiveness of powerful multilayered security. Rapid decryption algorithm. Device transparent to PARALLEL or SERIAL port. Complimented by low cost KEY-LOCK™ multifunctional COMPU-LOCK™ Countdown, timeout, data encoding, multi-product protection, DOS-UNIX Access control MICROCOMPUTER APPLICATIONS
3167 E. Otero Circle
Littleton, CO 80122
(303) 770-1917

SOFTWARE COPY PROTECTION

- Installs easily on your IBM-PC software
- Deletes all disk copy software
- Supports all Hard & Floppy disk formats
- Requires NO special devices or disks
- Invisible to your end user

Eval. disk protects 2 disks \$25
Starter kit protects 100 disks \$99
L-Tech Corporation
377 Route 17 South, Suite 618
Hasbrouck Heights, NJ 07604
(201) 288-1608 BBS 201-288-8795 (8-N, 1)

SECURITY



**SOFTWARE
OR
HARDWARE
GUARDING
YOUR
\$PROFIT\$**

Since 1986, thousands of companies worldwide have chosen Az-Tech Software as partners in their fight against Software Pirates. Why? Because Az-Tech has offered them

EVERLOCK SOFTWARE COPY PROTECTION

**EVERTRAK SOFTWARE SECURITY
EVERKEY II "The LOCK"
HARDWARE SECURITY**

These SECURITY SYSTEMS offer
REMOTE RESET CONTROL
SERIALIZATION
DATE & EXECUTE LIMITS
COMPRESSION
ENCRYPTION
and much, much more



These systems are easy to use and most important, they work! No others can provide the Compatibility, Flexibility, Ease of Operation and Degree of Protection that You receive with Az-Tech products

Call Today for a **FREE** Demo
800-227-0644



Az-Tech Software, Inc.
Security Products That Work
201 East Franklin, Suite 11
Richmond, MO 64085

(816) 776-2700 • FAX (816) 776-8398

CIRCLE 588 ON READER SERVICE CARD

STATISTICS

Power Designed to Fit Your Needs

MINITAB is the easy-to-use statistical package that lets you master a broad range of functions within one hour.

- Basic Statistics
- Regression
- Control Charts
- Hi-Res Graphics
- Time Series
- ANOVA and ANCOVA

...and more

CALL 800-448-3555

MINITAB
STATISTICAL SOFTWARE

Minitab Inc.
3041 Enterprise Drive / State College, PA 16801

CIRCLE 589 ON READER SERVICE CARD

TAXES

W2/1099 SOFTWARE

Major companies and CPA's rate our software tops! Create forms on HP LaserJet or use any preprinted forms. Creates IRS ready diskettes. Convenient data entry or import from dBase, Lotus or ASCII file. W2 & all 1099's. Network Ready! Easy to learn & use. Free Phone Support! \$129.00 (Network Version \$259).
Newport Wave, Inc.
15 McLean
Irvine, CA 92720
(800) 999-2611

UTILITIES

COPYWRITE

CopyWrite
Removes
Copy Protection
No more diskettes,
manuals or
codewheels

US \$75

1000's of products copied
Quaid Software Limited
45 Charles St. E., 3rd Fl., Dept. MM
Toronto, Ontario, Canada M4Y 1S2
(416) 961-8243 Fax (416) 961-6448

MISCELLANEOUS/ ACCESSORIES

DUST COVERS
100% COTTON CANVAS

Breathable! Static-Free! Beige with Grey Trim
For Computers, Keyboards, Printers & Lasers
All Popular Models. Superior Quality. Best Price

**NEW! ViziFlex-Seals
SKINS for Keyboards**



1-(800) 826-5761

Contemporary ComputerWear
1320-38th Ave San Francisco CA 94122
CIRCLE 590 ON READER SERVICE CARD

BAR CODING

BAR CODE READERS

Keyboard Wedges for
IBM PC/XT/AT, PS/2 models,
All Macintosh models,
IBM, DEC, MEMOREX/TELEX,
and Wang terminals.

Direct from manufacturer
Reseller inquiries welcome

BARKON ELECTRO-OPTICS, INC.

2222 GALLOWAY RD., SUITE 140
DUNN LORING, VA 22027

1-800-486-5121

CIRCLE 591 ON READER SERVICE CARD

PC Magazine Classified

is #1 in classified ad lineage in IBM-Standard computer publishing.

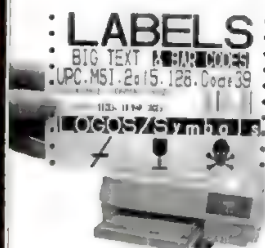
Join the winning team and place your ad.

Call **(212) 503-5115** or **(800) 825-4237**

BAR CODING

BAR CODE HEADQUARTERS

LABELING SOFTWARE



- For Epson, Oki, IBM, Dot Matrix and HP LaserJet Printers.
 - Any Format. Any size. Totally flexible design. Many formats furnished.
 - One Screen Label Design, WYSIWYG or text. Context sensitive help.
 - 16 text sizes — from .1" to 3" (reads at 100').
 - 13 Bar codes: 2of5, 128, UPC/EAN, MIL-STD, AIAG, ZIP, & Code 39.
 - Auto-incrementing. Simple operator interface. File input.
 - Reversals, color, soft fonts. Prints PCX files for logos, symbols, etc.
 - Powerful, Versatile, Easy, Fast! (drives LaserJet at 8ppm).
 - Scalable fonts any size to 13" on LaserJet III.
 - Label shown printed with LabelRIGHT™ — \$279
- (Other DOS bar code programs from \$129. SCO/UNIX — \$199).

PORTABLE READERS

- Battery operated reader. Wand or laser input.
- Simple, powerful, 64K or 256K memory. Built in real-time clock.
- Bar code or keyed input. Easy raised rubber keyboard.
- Reads Codabar, MSI, 2of5, UPC/EAN, 128, Code 39.
- Easily programmable prompts. RS-232 or keyboard wedge models.
- Doubles as non-portable reader (on-line wedge operation).
- 64K models, complete with wand — \$799



BAR CODE READERS

- For PC, XT, AT, PS/2, Mac and all RS-232 Terminals
- Attaches as 2nd keyboard. No software changes needed.
- Reads 2of5, Codabar, UPC/EAN, 128, MSI, Code 39.
- 1 or 2 input scanners: wand, slot badge, magstripe, or laser.
- Top rated by independent review!
- Complete with steel wand — \$399.

Direct from manufacturer
30 day \$ back guarantee!
Company P.O.'s accepted
2 year warranty on wand & reader



WORTHINGTON

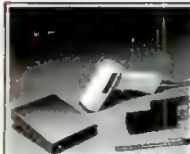
DATA SOLUTIONS

417 Ingalls Street • Santa Cruz, CA 95060

FAX 408-458-9964

408-458-9938

800-345-4220



BAR CODE & MAGNETIC STRIPE READERS

For PC/XT/AT, PS/2, and RS-232 Interface

- Direct keyboard interface, no software change
- Reads UPC, EAN, Code 39, 11, 128, I 25, Codebar, MSI
- Direct from manufacturer, 30 day money back guarantee
- Reader with steel wand — \$379
- with Magnetic Stripe Scanner — \$299
- Reseller discount available

SCANTECH

12981 Ramona Blvd. Unit 1 Tel: (818) 960-2999

Irwindale, CA 91706-3797 Fax: (818) 962-4819

CIRCLE 582 ON READER SERVICE CARD

Calling about an ad?

Say you saw it in

**PC Magazine
Classified**

PC WAND BAR CODE READERS MORE FEATURES MORE AFFORDABLE



Starting at \$279 with wand! • Transparent operation. • No software required • PC, XT, AT, Mac, PS2, others. Look into our full line of reliable, competitively priced readers, keyboard and serial wedges, portable data collectors, multi-drop readers, wands, laser scanners, mag stripe readers, and bar code printing software • OEM and reseller discounts. We provide solutions to systems! Custom application software for Data Collections available. Call for details.

INTERNATIONAL TECHNOLOGIES & SYSTEMS CORP.

655-K North Berry St., Brea, CA 92621

(714) 990-1880 • FAX (714) 990-2503

13 Welwyn Ct., Richmond, VA 23229

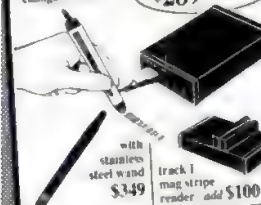
(804) 741-5725

CIRCLE 593 ON READER SERVICE CARD

EZBarcode Readers for PC, PS/2, Terminals

- Free year warranty — the best in the industry
- Free bar code printing utility included
- Installs in minutes — no drivers or software changes necessary
- Autodescrambling — reads all standard symbologies
- In stock, fast shipping
- 30-day money back guarantee

\$289 with rugged plastic wand



- with stainless steel wand \$349
- with laser scanner \$1385
- with track 1 mag stripe reader add \$100
- with CCD scanner \$885

RS-232 serial version, add \$30

Also available Portable bar code readers and bar code printing software

TimeKeeping Systems, Inc.

1396-A East 55th Street • Cleveland, OH 44103

(216) 361-9995 • FAX: (216) 361-4830

To place your ad in

PC MAGAZINE CLASSIFIED

Call (212) 503-5115 or (800) 825-4237

Classified Advertising
Information
(800) 825-4237

BAR CODING

DATA CONVERSION

BAR CODE READERS
AMERICAN MICROSYSTEMS
2190 A Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

FOR PC, XT, AT, PS/2 & TERMINALS:

- No software changes required
- Data appears as keyboard input
- Reads Code 39, 1-2015, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, CCD, LASER, MAG STRIPE

BAR CODE PRINTING SOFTWARE:

- For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers
- Prints Code 39, 1-2015, UPC/EAN, Codabar, 128, 93, 11, MSI/Plessey
- Easy to use

DECODER BOX

MAG STRIPE

SLOT (BADGE)

WAND

LASER

CCD

VISA

AM EX

(800) 648-4452 • FAX: (817) 585-8232
30 Day Money Back Guarantee
One Year Warranty

CHANGING WORD PROCESSORS?

Media transfer to or from
IBM, XEROX, DEC, WANG, EXXON, MACS,
LANIER, CPT, CT, MICOM, NBI, WRDPLX,
WORDSTAR, WORDPERFECT, MS/WORD, DW4,
MULTIMATE, SAMNA, MASII, DCA
*****FREE TEST CONVERSION*****
Conversion Specialists
531 Main St., Suite 835
El Segundo, CA 92045
(213) 545-6551
(800) 825-0540

DATA CONVERSION

If you want the
most complete
conversion
services in the
industry, just
call...



(800) CONVERT

Capabilities
include over
3000 formats

PIVAR
COMPUTING SERVICES, Inc.®

165 Arlington Heights Rd. #M
Buffalo Grove, IL 60089
(708) 459-6010

Classified Advertising
Information
(800) 825-4237

BOOKS/CATALOGUES/ PUBLICATIONS

DATA CONVERSION

**PUBLICATIONS FOR
COMPUTERS, INC.**

**Finally, the desktop
reference books you need
are available direct to you at
DISCOUNT!**

Hundreds of titles from major
publishers, beginner's guides to
advanced programmer's manuals.

Here's a sample from

McGraw-Hill	LIST	COST
Borland C++ Hndbk	\$29.95	\$24.95
DOS 5: Complete Ref	29.95	24.95
Hndb Grph 3 Made Easy	24.95	20.95
Liskin dBase IV 1.1 Hndbk	34.95	29.95
PC User's Guide	29.95	24.95
WP 5.1 Complete Ref	24.95	20.95

FREE Catalog Available

800-READMES

800-732-3637

MasterCard, VISA or COD

10 am - 6pm EST Mon-Sat

CIRCLE 595 ON READER SERVICE CARD

CONVERTING YOUR DISKETTES?

ENTRUST THEM TO US

2500 Word Processor & Computer
formats to 5 1/4" DISKS, MAGNETIC
TAPES, MAGNETIC CARDS,
CARTRIDGES & CASSETTES

**DISK DUPLICATION
OCR SCANNING SERVICES**

Customized conversions too!
Call us for quality, best prices and
quickest turnaround time.

COMPANY COMPENDIA, INC.
TEL: 312-419-8771 (Chicago)
FAX: 312-419-1390

CIRCLE 596 ON READER SERVICE CARD

**QUALITY
CONVERSIONS**

TAPE ↔ DISK ↔ SCANNING
Word Processors, Micros, Minis,
Main Frames, Typesetters.....
(Customized Programming Available)

IBM	APPLE	LANIER	MS/DOS
MAC	CPT	MICOM	SPREADSHEETS
WANG	NBI	UNIX	DATABASES
XEROX	EXXON	XENIX	MAILISTS
DEC	VYDEC	CP/M	2000 OTHERS

CARTRIDGES
Optical Filing Systems

CALL 1st
1st RUN Computer Services Inc.
1201 Broadway, Ste. 508 New York, N.Y. 10001

FREE TEST (212) 779-0800 BEST RATES (800) 833-2207

CIRCLE 597 ON READER SERVICE CARD

Ontrack Data Recovery

The Leader in Data Recovery Services

- 95% Success Rate
- Fast Turn Around
- Professional Clean Room
- Expertise with Novell, DOS, Macintosh, OS/2, Unix, Xenix, Bernoulli, Sun and more!

1-800-872-2599

INT'L: 612-937-5161 • FAX: 612-937-5750
CIRCLE 598 ON READER SERVICE CARD



Ontrack
Data Recovery

DISKETTE COPY SERVICES

**For Expert 24 Hour
Software Duplication**
Call 800-533-4188

- ◆ 100% Satisfaction Guaranteed
- ◆ Superb 7 Step QC Process with Digital Diskette Analysis
- ◆ Turnkey Printing, Packaging & Assembly Service Provided

EGHO
DATA SERVICES, INC.
In PA 215-363-2400

CIRCLE 599 ON READER SERVICE CARD

DATA CONVERSION

TOTAL SERVICE CONVERSIONS

- OUR NAME SAYS IT ALL •
 - Quality Service •
 - Quickest Turnaround •
 - Lowest Prices •
 - Free Test Conversion •
 - WordPerfect Training available •
 - 1-800-5-CONVRT (526-6878) •
- TOTAL SERVICE CONVERSIONS, INC.**
1933 North Monon Street
Los Angeles, CA 90027

PC Magazine Classified

is #1 in classified ad lineage in IBM-Standard computer publishing.
Join the winning team and place your ad.

Call **(212) 503-5115** or **(800) 825-4237**

DISKETTE COPY SERVICES

SUPPLIES

SOFTWARE DUPLICATION

- One-Stop Shopping
- Diskettes & Tapes
- Document Printing
- Custom Printing
- Custom Packaging
- Fulfillment
- Fast Turnaround



MEGAsoft

P.O. Box 6609, Freehold, NJ 07728

800-222-0490

In NJ 908-462-7628

FAX 908-462-5658

CIRCLE 800 ON READER SERVICE CARD

DUPLICATION FROM \$.59 HIGHEST QUALITY MEDIA

MSDOS duplication from \$.59 (5 25") and \$.89 (3 5"). Prices go even lower as you continue to order!

- Duplication + 100% Verification
- Custom Labels/Sleeves/Markers
- Custom Packaging & Assembly
- Colored Media Available
- Special Rates For Demo Software & Site Licensing
- Educational Discounts Available
- 24 Hour Turn-Around
- Guaranteed Products

800-255-3142

Diversified Systems Group, Inc.
PO Box 1114, Issaquah WA 98027

CIRCLE 751 ON READER SERVICE CARD

Software Production

- Full packaging services
- Duplication, all formats
- EVERLOCK copy protection
- Label and sleeve printing
- 48 hour turn around
- Fulfillment and drop shipment
- Consultation and guidance

Star-Byte, Inc.
2860 Bergey Rd. Hatfield PA 19440

800-243-1515

CIRCLE 752 ON READER SERVICE CARD

Classified Advertising
Information
(800) 825-4237

SOFTWARE

Quality Duplication of Affordable
Pricing • Custom Labeling &
Packaging • Fast Turnaround

Disk & Dups	500	1000	5000
5.25" DS/DD	.55	.50	.47
5.25" DS/HD	.90	.92	.88
3.5" DS/DD	.82	.79	.75
3.5" DS/HD	1.92	1.78	1.65

Prices include sleeves

DUPLICATION

(800) 426-0247
PRINCETON
DISKETTE

101 Richmond Ave. • Ft. Pleasant, NJ 08433

CIRCLE 753 ON READER SERVICE CARD

INSURANCE



SAFWARE

**INSURES YOUR
COMPUTERS**

Full replacement of hardware, media, purchased software. As low as \$49 yearly. Covers fire, theft, power surges, other accidents. Blanket coverage; no list of equipment needed. Call for information or immediate coverage.

1-800-848-3469
Local (614) 262-0559

SAFWARE, The Insurance Agency Inc.
2929 N. High Street, P.O. Box 02211
Columbus, OH 43202

CIRCLE 754 ON READER SERVICE CARD

U.S. Cartridge Service
COLORS AVAILABLE
TONER CARTRIDGES.
for laser printers
and PC Copiers
92 RANDOLPH AVE.
SO. SAN FRANCISCO, CA 94080
1-800-553-4345

REMANUFACTURED
WARRANTY
SAFE
\$29.95
20% MORE TONER
100% GUARANTEED
24 hr. TURNAROUND
WE BUY EMPTIES!!!

CIRCLE 755 ON READER SERVICE CARD

TONER CARTRIDGES
REMANUFACTURED
TESTED • GUARANTEED • 24-HR. TURN
Send empty cart. with wand.

• HP, Apple, Canon, etc. •
• Canon PC & Sharp Z-Copiers •
• IBM 4019 - 4 Colors! •
• HP Deskjet Refills - 5 Colors! •
• MICR Toner for Laser Checks •
Prices From \$45

MICR Toner & Fonts
HP2, 3, 3si

1-800-239-4027

ADVANTAGE LASER PRODUCTS, INC.

2216 University Blvd • Tuscaloosa, AL 35401
2030 Powers Ferry Rd. STE 218 • Atlanta, GA 30339

CIRCLE 756 ON READER SERVICE CARD

24 HOUR TURNAROUND
QUALITY TONER CARTRIDGE
REMANUFACTURING

• 20% More Toner • Darker Print • 100% Guaranteed
• Replacement drums now available • We Buy Empties
Laser Research, Inc.
8334 L Arrowidge Blvd
Charlotte, N.C. 28273
1-800-462-7143

\$39.95

CIRCLE 757 ON READER SERVICE CARD

To place your ad in
PC MAGAZINE CLASSIFIED
Call **(212) 503-5115** or **(800) 825-4237**



FACT FILE

Get The Word Out! Your Product Has Been Chosen EDITOR'S CHOICE.

Let us take your article to its highest level
of marketing potential with a reprint!

To find out how you can have your article or review elegantly reprinted**
on 80 lb. paper stock, in 4-color, 2-color or 1-color, call or write today:

Claudia Crichlow—Reprints Manager;
Ziff-Davis Publishing Company,
One Park Avenue, New York, NY 10016, 212-503-5447.

** Minimum quantity 500 reprints.

**EDITOR'S
CHOICE**

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue—\$600, 3 issues—\$550, 6 issues—\$510, 12 issues—\$480, 17 issues—\$460, 22 issues—\$450. Multiple-ad per issue rates also available. Prepayment must accompany each insertion. VISA/MC welcomed.

AD FORMAT:

PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish type-written copy. Ads include: 1) Headline (1 line, initial caps=30 characters max, all caps=25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, artwork or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

DEADLINES:

PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date. Please send copy and payment to: PC Magazine BusinessCard, One Park Avenue, 3rd Floor, New York, NY 10016, ATT: Richard Wortman. For more information, call Richard Wortman at 800-825-4237 or 212-503-5175, FAX: 212-503-5860.

HARDWARE/ADD-IN-BOARDS

VOICE MAIL TURNKEY SYSTEMS

•State-of-the-Art Voice Mail/Call Processing Systems - Ready to GO! •Effortlessly process your sales, inquiries, and messages. •COMPLETE SYSTEMS (expandable to 16 lines) from \$1495.

VOICE WORLD TECHNOLOGY

43 Monte Vista, Suite 2, Oakland, CA 94611
Phone: 510-655-6020

CIRCLE 1 ON READER SERVICE CARD

CD-ROM

\$ SAVE UP TO \$1650

On Turnkey CD-ROM drives with 6 great discs
• GENSTAR 2000 with I/F and six discs \$499 •
• PHILIPS 461 with I/F and six discs \$399 •
ALSO handle NEC, SONY, TOSHIBA, HITACHI, JVC, and more. Titles for PC, MAC, CD-I FREE CATALOG.

OMNICOMP

Route 2, Box 45-Valley View, TX 76272
Orders: 800-88-CDROM • INFO/FAX: 817-726-3756

CIRCLE 2 ON READER SERVICE CARD

New Release "VGA SPECTRUM"

•Sound Blaster*Adlib
•Over 1,600 Gif files*Animation
•Top 100 VGA/EGA Games*Utilities
Dealers Welcome*Other Titles Available
\$69-Free Shipping

S & S Enterprises

P.O. Box 552, Lemont, IL 60439
(800)ROM-DISC (708)257-7616

CIRCLE 3 ON READER SERVICE CARD

COMMUNICATIONS

KEYBOARD, VIDEO, MOUSE

EXTENSION with EXTENDER
SPLITTING with COMPANION
SWITCHING with COMMANDER
Boosts SIGNALS UP to 600 FT. Control Up to 96PC's with one KEYBOARD and MONITOR.

CYBEX CORPORATION

2800H Bob Wallace Ave., Huntsville, AL 35805
PHONE 205-534-0011 FAX 205-534-0010

CIRCLE 4 ON READER SERVICE CARD

COMPUTER SYSTEMS

LOWEST PRICES ON LAPTOPS

TOSHIBA • AST • LEADING EDGE • ALTIMA •
PANASONIC • SHARP • TEXAS INSTRUMENTS •
ZENITH • TWINHEAD • TANDON • LIBREX
WHEN YOU KNOW WHAT YOU WANT - CALL FOR A QUOTE.

THE LAPTOP BROKERS

1864 MCKINLEY ST., CLEARWATER, FL 34615
1-800-SHY-NERD 1-800-488-0550

CIRCLE 5 ON READER SERVICE CARD

386 Systems at Wholesale Price

386-25...\$1150 386-33 64K Ca..\$1310
•14" SVGA Color Mon 1024x768 •1Mb SVGA card
•1Mb RAM •42Mb HD •1.2 & 1.44Mb FD •101KB
•2s/1p/1g •1yr Warranty ... *FREE MOUSE*
4Mb RAM...Add\$144 85Mb HD...Add \$120

STARLIGHT COMPUTERS CO.

2828 W. Parker Rd. #202c, Plano, TX 75075
1-800-878-8198 214-596-4785/Fax:596-4887

CIRCLE 6 ON READER SERVICE CARD

486 Systems at Wholesale Price

486-25 128K Ca..\$1950 486-33 128K Ca..\$2150
•14" SVGA Color Mon 1024x768 •1Mb SVGA card
•4Mb RAM •85Mb HD •1.2 & 1.44Mb FD •101KB
•2s/1p/1g •1yr Warranty ... *FREE MOUSE*
210Mb HD...Add \$335. *BEST QUALITY & SERVICE*

STARLIGHT COMPUTERS CO.

2828 W. Parker Rd. #202c, Plano, TX 75075
1-800-878-8198 214-596-4785/Fax:596-4887

CIRCLE 7 ON READER SERVICE CARD

POSTSCRIPT CO-PROCESSOR

MUSTANG, For LaserJet II & III, video port, 10X> Pacific Page. 60% >68000 based printers. Flash ROM's offer field upgradable language updates. Soon! PCL5/6, Hi-Rez Postscript, and TrueImage. 2PC's can use one LaserJet.

STELLAR ASSOCIATES INC.

1336-A Channing Way, Berkeley, CA 94702
Tel:(510)649-4831 Fax:(510)704-0845

CIRCLE 8 ON READER SERVICE CARD

PERIPHERALS

Enhance Your Toshiba Portables

• Fax/Data Modem Int. Cards: 9600-G3/2400bps
• Options: MNP/2-5, Serial/Acoust. coupler ports
• Ser. Interface Cards: RS232, RS422, HPIL, etc.
• Cust. Interface Cards: SCSI Host, Dual RS232
• Vehicle Battery Adapters & Chargers, 12V PAK

PRODUCT R&D Corporation

1194 Pacific #201, San Luis Obispo, CA 93401
800/321-9713, 805/546-9713, fax 546-9716

CIRCLE 9 ON READER SERVICE CARD

PRINTERS

Printer Parts When You Need Them.

•Genuine manufacturer parts, supplies, and accessories for Okidata, Epson & Citizen.
•Same-day shipment.
•Large stock of printheads, circuit boards, motors, covers, manuals, and more. VISA/MC/Chk/MO

AGSON INC

2091 Springdale Road, Cherry Hill, NJ 08003
Call 1-800-444-4060 FAX (609) 751-5651

CIRCLE 10 ON READER SERVICE CARD

SECURITY

SECURITY PROBLEMS?

Permanently mold your name into your computer with BrandMark to prevent theft, one, two, or three lines on 3/4 x 2 3/4 area with 22 char. & spaces per line. 110VAC, adjustable temperature 0-750 Deg. \$119.95 + \$4.00 S&H.

F & K CONCEPTS INC.

462 CARTHAGE DR., BEAVERCREEK, OH 45434
800-323-2570 FAX 513-426-9722

CIRCLE 11 ON READER SERVICE CARD

SOFTWARE/ACCOUNTING

USA-TAX/1040 - \$19.95

Tax return program for PC's. 5th year. LASER and dot-matrix graphic 1040. Over 20 Forms, all IRS approved as printed. Does all computations, FAST and EASY. \$2 \$/H, Texas add 7.25% sales tax. 10-day moneyback guarantee.

Bammel Software

P.O. Box 382194, Duncanville, TX 75138
24hrs 800-324-8518 VISA/MC

CIRCLE 12 ON READER SERVICE CARD

ACCOUNTING SOLUTIONS

Complete Accounting G/L, A/R, A/P, I/C, Payroll SU/\$149 MU/\$299. Other systems J/C, BOM, Order entry. Call for Prices. Working Demos \$35. All systems use Btrieve(c). Source Code+4GL Lang available. Dealers wanted

Computer Accounting Solutions

1-(800)358-4222 or (714)335-1205
Redlands California

CIRCLE 13 ON READER SERVICE CARD

BUSINESS

COMPLETE VOICE MAIL SYSTEMS

Enhance your company image and increase your profits with Univoice Pro. Anywhere from single line up to 16 lines available. We can customize with you and the needs of your business in mind for as low as \$16 99. Call for more details.

UNIVOICE TECHNOLOGY

5901 Christie Ave. Ste 404, Emeryville, CA 94608
(510) 658-1515 Fax: (510) 658-1009

CIRCLE 14 ON READER SERVICE CARD

BUSINESS TIME MANAGEMENT

Haskell knows time & billing!

Manage and bill your staff time with TKR5, the management tool that makes you money! Features Open Item A/R, multi-offices, scheduling, SQL report writer, rolling WIP, much more. It is easy to use. Call us today for free demo disk.

E F HASKELL & ASSOCIATES

1110 E. MISSOURI #760, Phoenix, AZ 85014
800-732-3688 FAX 602-234-3644

CIRCLE 15 ON READER SERVICE CARD

CAD-CAM

GREAT NEWS AUTOCAD USERS

Save time & money using KIS Scaling w/AutoCAD. Makes detail work easy. Controls text & dim sizes + combine & create diff. scale dwgs inside a dwg. Tutorial + AutoSizing + Autosave. Intro only \$100 Orders 800-833-4547.

KIS SOFTWARE, INC.

PO BOX 663, Pearisburg, VA 24134
Order KIS Scaling today 800-833-4547

CIRCLE 16 ON READER SERVICE CARD

SAVE ON "CAD HARDWARE"

Plotters: Calcomp, Encad, HP, Hi, Roland. Digitizers: Calcomp, Summa, Hi, Kurta. Monitors: Hitachi, Mitsubishi, NEC, NSA. Workstations: AST, ALR, COMPAQ, DELL, EVEREX SPECIAL: CALCOMP 2036 A-E PLOTTER \$3,995.00

COM-TECH DATA INC.

1002 W. Front St., Midland, TX 79701
800-346-1204

CIRCLE 17 ON READER SERVICE CARD

COMPUTER LANGUAGES

FORTRAN LANGUAGE SYSTEMS

Editor's Choice & Tech Excellence Winner. Developing on a PC or porting code from a mainframe, we have the compilers. Starting at \$99. Call 800-548-4778

LAHEY COMPUTER SYSTEMS

BOX 6091 Incline Village, NV 89450
Tel: 702-831-2500 Fax: 702-831-8123

CONSTRUCTION

Job Cost Accounting Software

CMAS Plus is an integrated job costing, job billing and payroll accounting system designed specifically for mechanical, plumbing and HVAC contractors. Service modules streamline billing and dispatch. Runs on DOS, Novell, UNIX.

DATA-BASICS, INC.

11000 Cedar Road • Cleveland, OH 44106
(216) 721-3400

CIRCLE 18 ON READER SERVICE CARD

DATA BASE

dBASE file access from C/C++

Build a multi-user, 85k, dBASE compatible application using pulldown menus, popup windows, and data entry. Then port your application to UNIX. Microsoft Windows or OS/2 without changing any code. \$295 with source. FREE DEMO.

Sequiter Software Inc.

Box 5659, Stn. L, Edmonton, Ab., Can. T6E5V1
Call (403) 448-0313 Fax (403) 448-0315

CIRCLE 19 ON READER SERVICE CARD

DESKTOP PUBLISHING

Some INPUT for your OUTPUT

Desktop Publishing for Windows • Legacy-WP, Page Layout & Graphics in one \$357 • Micrografix Designer-The Science of Art \$519 • Niscan/GS-True Grayscale Hand Scanner \$254 Call for special promotional prices.

Compu-Graphics

500-A Amelia Ave Portsmouth, VA 23707
1-800-456-3877

CIRCLE 21 ON READER SERVICE CARD

EDUCATION

AUTHORIZING SYSTEM

Develop educational programs, limited only by your imagination. Include animation, graphics, sound, variable tracking, multiple branching, and more. Create stand-alone EXE's. Easy to use. No royalties. For IBM/Compatibles.

RIDGEWOOD SOFTWARE

P.O. Box 409, Glenview, IL 60025
(800) 243-4724

CIRCLE 22 ON READER SERVICE CARD

ENTERTAINMENT/GAMES

PRO FOOTBALL SOFTWARE

Pick NFL winners with PC-PICKS, the Pro Football Analyst. Includes 1991 schedule, huge stat/trend database, & FREE stat updates by modem. Fun to use. Great reviews in PC/C, PCM, & Pro Gamer! \$59.95. VISA/MC/Chk/MO.

MicroBrothers Software

1630 30th St. • Ste. 313 • Boulder, CO 80301
1-800-359-9000, ext. 865

CIRCLE 23 ON READER SERVICE CARD

ADULT VGA SOFTWARE

Stop Paying High Prices for Adult Software! We offer the Best in Adult VGA Software at Lowest Prices. Visa & MasterCard Accepted. Movies, Games, Pictures: 200+ Disks in Stock! (You must be 21 or older to order.)

CLEARLIGHT SOFTWARE

P.O. Box 1411, Milwaukee, WI 53201
(414) 962-2616

CIRCLE 24 ON READER SERVICE CARD

Go, NEMESIS, Go!

Go - a Zen game. So appealing, it has endured 4,000 years. So useful, governments study it. NEMESIS Go Junior entices novices of any age. NEMESIS Go Master Deluxe satiates the addicted. Chaos Manor Users Choice Award (Byte - 1990)

TOYOGO, Inc.

PO Box 25460-M, Honolulu, HI 96825-0460
(800)869-8469 (808)396-5526 fax: 396-4126

CIRCLE 25 ON READER SERVICE CARD

FINANCIAL

Retire A.S.A.P.

Retirement? A little planning can make a big difference. Retire ASAP helps you make your own complete retirement plan. Find out how much you need to save and much more! Interesting & easy-to-use. Investmt guide incl. \$99

Calypso Software Corporation

P.O. Box 3367, Redmond, WA 98073-3367
(800) 225-8246

CIRCLE 26 ON READER SERVICE CARD

FREE STOCK DATA

Download HISTORICAL stock data for free!! Call our BBS. Also available is a weekly update disk that contains the daily HIGH, LOW, CLOSE and VOLUME for approx 6000 stocks \$4/week. Write or call for more info.

FARPOINT

3412 Milwaukee • #477, Northbrook, IL 60062
Modem users (312) 274-6128 8-N-1 12/2400

CIRCLE 27 ON READER SERVICE CARD

FLOW CHART

Windows flowcharter \$129

RFlow 2.0 is a professional drawing tool for flowcharts and org charts. Requires Microsoft Windows 3.0. 100 shapes auto adjust in size. Diagonal lines and curves. Auto line routing and re-routing. Call for free trial disk.

RFF Electronics

1053 Banyan Court, Loveland, CO 80538
Phone: 303-663-5767 Fax: 303-669-4889

CIRCLE 28 ON READER SERVICE CARD

GENERAL

SOFTWARE FINDER SERVICE

Unable to find the right application software? Call us with your requirements and we can search our comprehensive library covering over 18,000 software packages for all business and technical fields and for all hardware systems.

SOFT-SEARCH

\$15.95 per S.W. abstract (Fax or Mail)
Call 1-800-666-7724 VISA /Mastercard

CIRCLE 29 ON READER SERVICE CARD

GRAPHICS

35mm SLIDES • OVERHEADS

Vibrant, high-quality output from your PC software. Dozens of software packages supported. Transmit your files anytime. Free reshoots. For free user kit call toll-free 1-800-433-8829

IMAGE CENTER

1011 Second St., S.W. • Roanoke, VA 24016
703-343-8243 • Fax 703-343-0691

CIRCLE 30 ON READER SERVICE CARD

Great Slides and Great Service

Finally...MILLION dollar slides at prices you can afford. Our Economy Service is only \$4. We support most PC and Macintosh applications. Color prints, overheads and scanning service available. Call for free brochure.

GALAXY GRAPHICS, INC.

Office: 703-802-1111 FAX: 703-263-1111
24 Hour Modem Service: 703-843-0329

CIRCLE 31 ON READER SERVICE CARD

PEN PLOTTER EMULATOR

FPLOT turns your printer into an HP pen plotter. Fast hi-res, no jagged lines. Vary line width, color. Screen preview - zoom, pan. Works with CAD, graphics programs. Supports most printers. NEW v3. \$119+\$3 S&H. VISA/MC/Chk/MO.

FPLOT Corporation

24-16 Steinway St., Suite 605
Astoria, NY 11103 • 718-545-3505

CIRCLE 32 ON READER SERVICE CARD

Hand Your Business Card...

To 800,000 of the most qualified buyers in the PC market. These brand-specifiers are looking to buy while reading the industry's #1 publication. There is no more cost-effective or efficient way for you to build sales.

BusinessCard

Call Richard Wortman today.
1-800-825-4237

CIRCLE 33 ON READER SERVICE CARD

HEALTH

Nutrition/Medical Diagnosis

The Leader in Nutrition & Exercise Software! Analyzes Recipes, Diets; Auto-Creates Menus. Allergy, Drug, & Differential Diagnosis. Veterinary Diagnosis & Animal Nutrition. Over 100,000 sold. IBM & MAC. Call for free demo.

N-Squared Computing

3040 Commercial Street SE, Suite 240
Salem, OR 97302 (503) 364-9118

CIRCLE 34 ON READER SERVICE CARD

PREVENTIVE MAINTENANCE

FLEET/EQUIP MAINTENANCE

A preventative maintenance & report system for vehicles/equip that need periodic service. Some features: Scheduled service reports, Service history, Full operating cost reports, User defined codes, Cost per mile/hour reports.

Ram Systems, Inc.

224 Causeway Blvd., La Crosse, WI 54603
(608) 782-8130 FAX: (608) 784-5115

CIRCLE 40 ON READER SERVICE CARD

REAL ESTATE

1031 Tax Free Exchanges

Follow the easy step by step directions, make just 7 entries, and the program will make all 3 basic calculations, create a computer file, and print a worksheet (Laser or Dot Matrix). IBM compatibles 5 1/4". Just \$29.95 Visa/MC ok.

Value-Added Tax Systems

505 E. 1st St, Suite H Tustin, CA 92680
1-(800)676-1031 Fax (714) 832-6248

CIRCLE 46 ON READER SERVICE CARD

PROGRAMMERS TOOLS

Top-Rated Nutrition Programs!

Analyze diets, recipes, menus. Over 50 easy to use functions. 2400 to 10,000 foods. Tens of 1000's satisfied users. Affordable.

FREE Demo Disk!

ESHA Research

POB 13028, Salem, OR 97309
503-585-6242 fax:503-585-5543

CIRCLE 35 ON READER SERVICE CARD

Powerful Turbo Pascal Tools

Libraries from TurboPower help you develop Turbo Pascal applications easier and faster. Expert say "An Essential Toolkit", "Outstanding". OOP and non OOP libraries, BTree, Async and more. Call or write for a FREE brochure.

TurboPower Software

P.O. 49009 Colorado Springs, CO 80949-9009
(800) 333-4160. FAX (719) 260-7151

PROPERTY MANAGEMENT

Since 1978 over 7,500 users of our software have found it comprehensive, flexible & easy to use. We offer systems to manage: Commercial/Residential/Condominium/Homeowners/Assoc./Muni-Storage Facilities. For info. & prices call:

REALTY AUTOMATION

11365 East Shore Drive, Hayden Lake, ID 83835
(208) 772-3259

INVENTORY

dFELLER Inventory

Business inventory programs written in modifiable dBASE source code. dFELLER Inventory \$150, dFELLER PLUS \$200 with History and Purchase Orders (Good for Stockrooms) Requires dBASE III PLUS, or dBASE IV.

Feller Associates

550 CR PPA, Route 3 Ishpeming, MI 49849
906-486-6024

CIRCLE 36 ON READER SERVICE CARD

QB/PDS/Visual Basic Tools

We offer the best assortment of add-on products. Our specialty is easy-to-use assembler routines to make your programs smaller & faster, TSR's, communications and productivity tools to save you time. No royalties.

MicroHelp, Inc.

4636 Huntridge Drive, Roswell, GA 30075-2012
(800) 922-3383 (404) 594-1185

CIRCLE 42 ON READER SERVICE CARD

PROPERTY MANAGEMENT

Rental-Ease. State of the art software for managing income properties of all types. Fast and easy to use. Tracks tenants, income and expense, maintenance and repairs, GL. \$695 complete. Free brochure, demo \$10.

STRATEGIC OFFICE SYSTEMS

688 N. 500 W. #61, Mt. Pleasant, UT 84647
800-942-6784 or 801-462-2130

CIRCLE 48 ON READER SERVICE CARD

INVENTORY MANAGEMENT

Stock-Master 4.0, com. grade system, has Stock Status Rptg, PO Write & Track, Trend Analysis, QC Rptg, Trans Hist Detail Analysis, Multi Loc support, BOM, Matl Req Planning, Serial/Lot No Track, Quote/Ord/Inv Prep.

Applied Micro Business Systems, Inc.

177F Riverside Ave., Newport Beach, CA 92663
714-759-0582

CIRCLE 37 ON READER SERVICE CARD

BASIC PROGRAMMING TOOLS

Crescent Software offers many tools for QuickBASIC and PDS, all with tutorials and full source. Assembly routines, graphics, screen design w/data entry, BASIC TSR's, and much more. No royalties. Call or write for our catalog.

Crescent Software

32 Seventy Acres, W. Redding, CT 06896
Orders: 800-35-BASIC, Tech: 203-438-5300

Property Management

Software for managing residential, commercial, condos, etc. Basic version for owner/manager-\$495, Deluxe for professional managers-\$1,195, Network-\$2,395. Includes check writing, recurring expenses, G/L, management reporting.

YARDI SYSTEMS, INC.

819 Reddick Street, Santa Barbara, CA 93103
(805) 966-3666

CIRCLE 49 ON READER SERVICE CARD

MAPPING

County/Custom Maps + Software

Zoom in/out: Search for streets/intersections. Create overlays/icons. Control info displayed. Plenty of other features. County/Custom maps Available. Most counties - \$195 - Return in 30 days if not satisfied for full refund.

POLESTAR

1716 Tipton Drive, Crofton, MD 21114
301-261-3529

CIRCLE 38 ON READER SERVICE CARD

Database Management for BASIC!

db/LIB Database Library adds real database management to your MS BASIC PDS or QuickBASIC programs. Reads and writes dBASE III DBF and NDX files. Assembly language, no royalties. For PDS - \$189, QB - \$99, Networks - \$575.

AJS Publishing, Inc.

P.O. Box 83220, Los Angeles, CA 90083
(800) 992-3383 (213) 215-9145

CIRCLE 44 ON READER SERVICE CARD

RELIGION

Bible Study Software

For 10 years we have remained the leading Bible study software company. Think of us as a Bible bookstore with an integrated family of software products for your Bible study needs! Call for a FREE catalog!

Bible Research Systems

2013 Wells Branch Pkwy. #304 Austin, TX 78728
1-800-423-1228 1-512-251-7541

MEDICAL

PRACTICE BILLING

MD VersaForm, flexible, ledger based design, billing package. Programmable; customizable reports, files, & screens; includes database mgmt system & full source. LAN support. \$995 single user. Free literature & demo, Drs. wanted.

Applied Software Technology

591 W. Hamilton Ave., Ste. 201, Dept. 99
Campbell, CA 95008 (800)678-1111 Ext. 99

We Make It So Easy—

Leave your business card with us and we'll do the rest. PC Magazine will create your BusinessCard for you. It's so easy—and so very effective.

BusinessCard

Call Richard Wortman today.
1-800-825-4237

CIRCLE 45 ON READER SERVICE CARD

SALES MARKETING

mSOFT® - Triple Your Sales!

Salespeople/AE Tracking•Contact Mgt• RFQ•Std & Custom Quotes•Orders•Pricing•Forecasting•Auto Dial•Letters•Scheduling•Labels•Report Writer•Calculator•Calendar•Notes•Import Files•Single & Multi-LAN•Source Code•FREE Demo

RAVIS Software, Inc.

PO Box 232 Madison NJ 07940
201-455-0228 or 201-301-0566

CIRCLE 51 ON READER SERVICE CARD

READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.
3. The literature will be mailed to you from the advertiser free of charge.

Valid after February 29, 1992

CIRCLE FOR FREE INFORMATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40												
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248
249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404
405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456
457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508
509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612
613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664
665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716
717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768
769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872
873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924
925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976
977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000																												

PC 10/29-1

1. Do you work in a DP/MIS department?
01. ☐ Yes 02. ☐ No
2. Please indicate your company or organization's primary business activity: (Check one only)
01. ☐ Manufacturer of Computer Equipment, Computers, Software
02. ☐ Manufacturer—Aerospace
03. ☐ Manufacturer—Other
04. ☐ Systems House
05. ☐ Computer Consultant
06. ☐ Computer Retailer/VAR/VAD Distributor
07. ☐ Communications
08. ☐ Finance/Banking/Insurance/Real Estate/Accounting
09. ☐ Education
10. ☐ Government—Federal
11. ☐ Government—Non-Federal
12. ☐ Research and Development
13. ☐ Data Processing/Computer Service
14. ☐ Health/Medical/Legal Service
15. ☐ Engineering/Architecture
3. Please indicate your primary business function: (Check one only)
01. ☐ DP/MIS
02. ☐ Systems, Programming
03. ☐ Communications
04. ☐ Engineering
05. ☐ Res./Dev./Scientific
06. ☐ Accounting/Finance
07. ☐ Computer Consulting
08. ☐ Purchasing
09. ☐ Operations
10. ☐ Production
11. ☐ Education/Training
12. ☐ Marketing/Sales
13. ☐ Medical/Legal
14. ☐ Admin./Mgmt.
99. ☐ Other
4. Is your company a reseller?
01. ☐ Yes 02. ☐ No
5. For how many IBM PCs and compatibles do you specify brands of products:
01. ☐ 10 or less 03. ☐ 26-99
02. ☐ 11-25 04. ☐ 100 or more
6. Are there any PCs in your office? (Check all that apply)
01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together
7. Please check the equipment currently installed at your location: (Check all that apply)
01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
04. ☐ Macintosh
8. Do you plan to buy any PC Products?
01. ☐ Now
02. ☐ In 4 to 6 months
03. ☐ In 7 to 12 months
04. ☐ No definite plans
9. Number of Employees in your entire company:
01. ☐ 25 or less
02. ☐ 26-99
03. ☐ 100-499
04. ☐ 500-999
05. ☐ 1000 or more

Please print.
Name _____
Title _____ Phone (____) _____
Company _____
Address _____
City _____ State _____ Zip _____
Signature _____ Date _____
☐ Please send me one year (22 issues) of PC Magazine for \$29.97. Offer valid in U.S. only.

READER SERVICE CARD FREE INFORMATION

IT'S AS EASY AS 1, 2, 3

1. Fill in your name and address and check off your answers to the nine research questions.
2. Circle the numbers on the card that correspond to the ads or articles you'd like more information about.
3. The literature will be mailed to you from the advertiser free of charge.

Valid after February 29, 1992

CIRCLE FOR FREE INFORMATION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40												
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248
249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308																																												



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 433 RIVERTON, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



P.O. BOX 1687
RIVERTON, NJ 08077-9687



SCIENTIFIC

SCIENTIFIC ACCELERATOR

25 MegaFLOP Floating Point Array Processor with 256K+ static memory. Easily programmed by calling 598 routines from your C, FORTRAN, or Pascal PC programs. 512x512 FFT 1.18 secs. Single slot board with software: \$2,495.00.

EIGHTEEN EIGHT LABORATORIES

1247 Tamarisk, Boulder City, NV 89005
Tel: 800-888-1119. Fax: 702-294-2611

CIRCLE 52 ON READER SERVICE CARD

UTILITIES

POPUP HYPERTEXT HELP \$69

HYPERHELPER converts text into compressed hypertext. Includes compiler, TSR/standalone browsers, utils. Perfect for context-sensitive online help, manuals, etc. Small, simple, royalty-free. In use world-wide. FREE DEMO.

AZARONA SOFTWARE

P.O. Box 13433, Denver, CO 80201
Ph: 303-697-1088 Cserve: 73057, 3172

CIRCLE 58 ON READER SERVICE CARD

BATDBG

- interactive debugger for DOS batch programs
- single/multiple step trace
- breakpoints
- parameter/file viewing
- \$50. (check/m.o.)

TBD Software

9502 Gladeview, San Antonio, TX 78250
512-647-1641

CIRCLE 64 ON READER SERVICE CARD

Scientific SW - FREE CATALOG

A great selection of scientific software products for plotting, non-linear curve fitting, chemical equilibrium calculations, simulation, statistics, differential equations, symbolic algebra, and more.

MicroMath Scientific Software

Box 21550, Salt Lake City, UT 84121-0550
1-800-942-6284 FAX (801)943-0299

CIRCLE 53 ON READER SERVICE CARD

DOS EXTENSIONS / PROFESSIONALS

Do Your Job Faster, Better, Easier. Add functionality, power & usefulness to your PC. Super charge it with this unified pkg. of utilities that exceeds all expectations. - Perfect companion to DOS 5.0. Only \$79 w/\$Back GRNTD.

ALISON SOFTWARE

166 Shady Lane, Apollo, PA 15613
(800)837-1492 or 412-392-2459 - 24HRS

CIRCLE 59 ON READER SERVICE CARD

STORAGE MASTER

Keep track of your disks. Catalog floppy/fixed disks. View contents, locate files quickly. Attach notes to files or directories. Sort directories by name/date/size. See free/used space. \$49.95. MC/VISA/DIS/AE

French Market Software Inc.

136 Espy Ave., Pass Christian, MS 39571
(800) 445-8001 (601)467-0924

CIRCLE 65 ON READER SERVICE CARD

STATISTICS

Statistical Advisor Speaks English!

Statistical Navigator Professional™ lets you describe your research goal in plain english, guides you to the appropriate statistical analysis. Natural language interface, detailed report, extensive hypertext help, & pull-down menus.

The Idea Works, Inc.

607 Jackson St., Columbia, MO 65203
800-537-4866/314-875-5827/Fax 314-875-5812

CIRCLE 54 ON READER SERVICE CARD

PTRSET 1.0 Printer Controller

DOS level. Use words you define to control your printer. Group codes into one word. Includes many Epson, HP, & Okidata codes for easy setup. Special introductory price...\$29.95 (plus s/h). For info. or check/MO orders call: (708) 960-4136.

Empyrean

2728 Jackson Drive, Woodridge, IL 60517
Visa/MC ORDERS ONLY! 800-243-1515 ex-850

CIRCLE 60 ON READER SERVICE CARD

The Windows Shopper's Guide™

The most complete and comprehensive source for Windows product information. Features descriptions, vendor contact data and list prices for over 1,100 Windows products and services. 336 pages. \$23.45 (U.S.P. & H. included) Visa/MC/AMEX

WhiteFox Communications, Inc.

1800 N.W. 169th Place, Beaverton, OR 97006
800-669-5612

CIRCLE 66 ON READER SERVICE CARD

WINDOWS

NCSS 5.x Series - \$125

"Best value & easiest to learn/use" PC-Week. Menus/Spreadsheet. Means, etc. Regression, t-tests, ANOVA. Factor, cluster & discriminant. Cross tabs. Nonparametrics. Histograms. Plots. Reads ASCII/Lotus. Many extra modules.

NCSS

329 North 1000 East, Kaysville, UT 84037
Phone: 801-546-0445 FAX: 801-546-3907

CIRCLE 55 ON READER SERVICE CARD

REMOVE HARDWARE LOCKS

Protect your investment! Maintain Productivity! Software utility that allows for the removal of hardware locks. Available for most CAD/CAM & PCB sw programs. Easy - Simple - Guaranteed Programs start at \$99.00 Call or Fax for info.

SafeSoft Systems Inc.

202-1100 Concordia Ave., WPG. Mb, CANADA
R2K 4B8 (204)669-4639 Fax(204)668-3566

CIRCLE 61 ON READER SERVICE CARD

Chart Champion-PC WEEK 6/24/91

QuickGraph Plus - Sideways Printing of Graphs on Multiple Pages. 57 Types of 2D, 3D graphs-Bubble, Time-Series, Tiled, Hot-Link & Batch. DDE. Runtime for Slide shows. DOS and Windows 3.0 versions. Only \$149.95.

Sumak Enterprises Inc.

39 Dawson Dr., Sudbury, MA 01776
Phone: 800-732-7003 Fax: 508-443-5895

CIRCLE 57 ON READER SERVICE CARD

SURVEYS

The Survey System

Analyzes market research, public opinion, customer satisfaction and employee attitude surveys. Easy to learn and use. Produces presentation quality tables and graphics. Statistics, verbatim, interviewing and network options.

Creative Research Systems

15 Lone Oak Ctr. - Dept. P, Petaluma, CA 94952
Ph:(707)765-1001 Fax (707)765-1068

CIRCLE 56 ON READER SERVICE CARD

DISK INDEX utility for IBM

Maintains a master index of all your disks + files. Easy to use, saves time in finding files. Sort files 64k+. Requires DOS 3+. Limited time offer \$20 + \$3 S&H (NYS add tax). Specify 3.5 or 5.25 disk.

The ALTERNATIVE

RD 1 Box 248, Mt.Upton, NY 13809
(607) 895-6417

CIRCLE 62 ON READER SERVICE CARD

Personal Measure

Finds performance bottlenecks in PCs. "can enhance anyone's diagnostics artillery". W. Rosch, 8/89 PC Mag. NOW measure and tune Windows 3.0! Most major LANs. Shows you how your apps spend time. \$125+s&h (5.25" or 3.5") MC/VISA.

Spirit of Performance, Inc.

73 Westcott Road, Harvard, MA 01451
tel: 508-456-3889, telex 6503571400

CIRCLE 58 ON READER SERVICE CARD

MULTIPLY—

Your sales by handing your business card to over 800,000 buyers at one time in the place where they seek to buy—tell them about your product in PC Magazine Marketplace BusinessCard.

BusinessCard

Call Richard Wortman today.
1-800-825-4237

CIRCLE 57 ON READER SERVICE CARD

Add Voice to Your Spreadsheet

Proofreading / data verification made easy with this Lotus 1-2-3 add-in. Requires no additional hardware. Options for playback including pause, direction, speed, 6 languages, headset output. 1-2-3 v 2.xx. Only 20K RAM! \$149.

Temair Software Corporation

One Richmond Square, Providence, RI 02906
(800) 933-8980

CIRCLE 63 ON READER SERVICE CARD

Labeling & Barcoding Software

WYSIWYG design / Built-in data base w/file import / Scalable fonts / Many barcodes / Variable code densities, ratios, heights / Batch printing / PCX image support / Dot matrix, laser, thermal printers / \$259 and up.

LabelSoft™

P.O. Box 488, Perrysburg, OH 43552
(419) 874-8502 FAX (419) 874-9313

CIRCLE 69 ON READER SERVICE CARD

MISCELLANEOUS/BAR CODING

BOOKS/CATALOGUES/PUBLICATIONS

WORK FROM HOME

NEW! now you can earn big money with your PC! Dozens of proven money-making methods help you get started immediately. Free information.

The Home Business Hotline

50 Vermont Avenue, TORONTO, Ontario
Canada M6G 1X9 ext B

CIRCLE 88 ON READER SERVICE CARD

SERVICES

GRAPHICS SCANNING SERVICE

Any LOGO/ART CONVERTED to graphics image! Send camera ready art or clear crisp copy. Choose WordPerfect, TIFF or PCX format & DS/DD disk size (5.25or3.5). WP5.1 Letterhead/Envelope Macro & S/H INCLUDED! Send \$25.00 per image:

SCANIT

5405 Alton Parkway, Suite 5A441
Irvine, CA 92714 714/559-0821

CIRCLE 91 ON READER SERVICE CARD

TRAINING/TUTORIALS

Learn PC & DOS by VCR Tape

Don't be at the mercy of Technicians! Learn visually how to buy & use the right PC for you. 4-hour tape explains all components and how they work. Teaches DOS 5.0 too. \$29.95 + \$5.00 S&H. Send Ck or MO to:

JUST computers

33541 Overland, Agua Dulce, CA 91350
1-805-268-0072 FAX: 1-818-365-1230

CIRCLE 94 ON READER SERVICE CARD

DISKETTE COPY SERVICES

DUPLICATE DISKS FAST!

DiskDupe copies 2 to 6 times faster than DOS! Reads master once, makes unlimited copies. Stores images on hard disk. Pull-down menus. Automatically formats. 5", 3", high-density. Only \$79. Money Back Guarantee!

MICRO SYSTEM DESIGNS, INC.

4962 El Camino, Suite 204, Los Altos, CA 94022
(415) 964-2844 Fax: (415) 964-4529

CIRCLE 89 ON READER SERVICE CARD

Signature Scanning Service

Let your LaserJet or compatible printer sign your form letters with your digitized signature. Professional! Fast! Inexpensive! Guaranteed! Only \$60 each or less. Free samples available. Inquires about digitized letterhead.

Orbit Enterprises, Inc.

PO Box 2875 Glen Ellyn, IL 60138
(800) 767-6724 - (708) 469-3405

CIRCLE 92 ON READER SERVICE CARD

CONSULTANTS/TECHNICIANS

Work for yourself! No investment needed! Sale and service leads provided. All hardware and operating systems! Any certifications are a plus but not necessary! All areas needed! We provide complete kit with approval of a

UCOMPUTE NATIONAL SERVICE

39 West 74th St. Suite 1B, NY, NY 10023
800-788-5818

CIRCLE 95 ON READER SERVICE CARD



PC MAGAZINE MARKETPLACE

One Park Avenue
Third Floor
New York, NY 10016
Att.: Vickie Pinsky

For further information
on advertising in
PREMIER,
CLASSIFIED or
BUSINESSCARD,
contact your account
representative or call
212-503-5115 or
1-800-825-4237.

ADVERTISING ACCOUNT REPRESENTATIVES

Sr. Account Representative

Charles Boyar 212-503-5118
CA (415, 619, 818)

Sr. Account Representative

Kathleen Morris 212-503-5125
AZ, CA (209, 707), CO, ID, MO,
NV, OH, OR, WA, CANADA,
OVERSEAS

Louella Dixon

212-503-5145
AR, CT, CA, ME, NC, NH, NJ, PA,
RI, SC, VT

Margaret Kennelly

212-503-5176
IA, IL, IN, KS, MI, MT, NE, NY,
UT, WY

Mike Medwig

212-503-5193
CA (714, 805, 916), FL, MA, MN,
ND, NM, SD, WI

C. Wesley Walton

212-503-5117
CA (213, 408), HI

212-503-5156

AL, DC, DE, KY, LA, MD, MS, OK,
TN, TX, VA, WV

BusinessCard

Account Representative

Richard Wortman 212-503-5175

NATIONAL ADVERTISING STAFF

Vice President,
Classified Advertising
Paul Stafford

Classified Advertising Director
Vickie L. Pinsky

Sr. Advertising Coordinator
Wanda D. Brown

Production Director
Anne Brockinton

Production Supervisor
Bessi Dion

Production Coordinator
Mary C. Murawinski

Announcing

Select Demos™

The Easy, Hands-On Way To Identify, Evaluate And Compare Software Products

BONUS Includes
a complete copy of
**GeoWorks
Ensemble™**
1.0

LIMITED-TIME
OFFER
Just \$99
LIST PRICE \$149
ORDER NOW AND SAVE
\$50.00

Now you can identify, evaluate and compare over 1,000 software programs, quickly and easily. Just use SELECT DEMOS. It features over 1,000 MS-DOS® and Windows® based software demonstrations and working models, plus 7 complete programs.

SELECT DEMOS lets you "shop-at-your-computer" for the best software available. You get complete product demonstrations. Full technical specifications. And hands-on experience to help you make the smartest buying decision possible.

With SELECT DEMOS you'll know before you buy. You'll know if the program really meets your needs. If it's within your budget. If the interface is easy to work with.

SELECT DEMOS eliminates the risk of missing important software products because you'll get a full range of available software programs for different applications.

And SELECT DEMOS saves you hours, even days. SELECT DEMOS does all the legwork for you. You are presented with the most complete, most current demos, all on one convenient disc.

SELECT DEMOS Lets You Put Software To the Test And Show Your Results To Others

SELECT DEMOS' powerful search software helps you identify the programs that might meet your needs. Then copy the demos to floppy disks to compare and evaluate.

Once you've decided on the programs you like best, you can show them to management, or to the people who will use the programs. It's a great way to support your purchasing decisions.

Save \$50.00 If You Act Now

Order now and save \$50.00 off the regular price. Just \$99 for over 1,000 software demonstrations on Select Demos. But only if you call or write now. Hurry!

New From The Publishers Of PC Magazine, PC/Computing and PC Week...SELECT DEMOS Gives You Demos Of Over 1,000 Top Software Products On One CD-ROM—Plus 7 Complete Programs Included FREE!

SPECIAL BONUS

VALUABLE SOFTWARE PRODUCTS FREE

In addition to over 1,000 demos, you'll also receive complete versions of these products—as a special free bonus!

GEOWORKS ENSEMBLE™

Winner of four Software Publishers Association 1990 Excellence Awards, including Best Personal Productivity and Best Consumer programs; 1990 Most Valuable Product by PC/Computing; and 1990 Product of the Year by InfoWorld, this high performance, multitasking graphical environment comes complete with seven state-of-the-art applications: word processing/desktop publishing, file management, communications, drawing, scheduling, personal information management and Solitaire. Advanced imaging and printing technology permits multicolumn formatting, 24-bit color and font scaling with true WYSIWYG output on a wide variety of dot matrix, ink jet or laser printers. Ensemble multitasks on any PC, from an XT to a 386, laptop or desktop computer. MSDOS 5.0 compatible. List Price \$199.95.

CheckFree®—An electronic bill-payment program that allows you to simply and safely pay bills without using a pen, checkbook, envelopes or stamps. Transactions are automatically recorded and documented on your bank statement. Permits tracking of bills by multiple budget categories and split transactions. List Price: \$29.95

Smartcom EZ—A complete communications program from Hayes Microcomputer Products featuring storage of parameters for multiple services, Xmodem file transfers. TTY/VT102 emulation and keyboard macros. List Price \$49.

Plus four leading 1990 personal tax programs—Andrew Tobias' TaxCut™ (MECA Software), MacIntax™ For Windows (Softview), TurboTax® Personal (ChipSoft), and 1040™ (G&G Software). Combined List Price: \$579.

Total price if purchased separately: \$857.90. But it's all yours free from Select Demos!



Over 1,000 software product demonstrations at your fingertips. Easy-to-do searches locate the programs you want to try by name, vendor, type of product, price or other descriptive information.

The world's leading software publishers have included demos of their products in SELECT DEMOS. You'll be able to try over 1,000 software demos, all the applications you want most, from over 600 leading software publishers. Here are just a few samples...

Word Processing: Ami Pro™; Microsoft® Word; Professional Write® Plus; WordPerfect®; JustWrite™.

Spreadsheets: CA Compete!™; Microsoft® Excel; Lotus® 1-2-3® Release 3.1; Quattro® Pro; SuperCalc 5®; Lotus® Symphony®.

Presentation Graphics: Applause II™; Lotus® Freelance® PLUS; Hollywood™; Presentation Team™; Microsoft® PowerPoint; Storyboard™ Live!; Aldus Persuasion®.

Desktop Publishing: The New Print Shop®; Aldus PageMaker®; Ventura Publisher®.

Personal Information Management: Lotus® Agenda®; Current; SIDEKICK®.

Database: dBASE IV®; DataEase®; DataPerfect®; FoxPro™; PARADOX®.

GUI Environment: GeoWorks Ensemble™; TOOLBOOK®; Microsoft® Windows™ 3.0.

Drawing: Artline®; CORELDRAW!; GEM® Draw Plus™; PC Paintbrush IV Plus™.

Network: LANtastic; Saber Menu System; VINES®/386.

Communications: CO/Session; DynaComm®; Smartcom Exec™; BeyondMail™; cc:Mail.

CAD: AUTOSKETCH®; Generic CADD.

Accounting: ACCPAC®; DacEasy™...and much, much more!

ORDER NOW AND SAVE \$50.00 ON SELECT DEMOS AND GET 7 COMPLETE PROGRAMS—FREE.

1-800-848-1472 EXT. 102

OUTSIDE U.S. CALL (212) 503-4400

COMPUTER
LIBRARY

1 Park Avenue, New York, NY 10016

© 1991 Ziff Communications Company. All rights reserved. Computer Library and Select Demos are trademarks of Ziff Communications Company. Other trademarks mentioned are trademarks of their respective companies.

CIRCLE 183 ON READER SERVICE CARD



ADVERTISING SALES STAFF

One Park Avenue, New York, NY 10016
(212) 503-5100

DISPLAY ADVERTISING

NATIONAL

Nancy Newman - National Advertising Director
(212) 503-5204

Sales Manager
Michael Hatherill
(212) 503-5128

Ad Systems Supervisor
Allyson Deane
(212) 503-5044

Sr. Advertising Coordinator
Christine Holsten
(212) 503-5264

Advertising Coordinator
Lynette Stiffa
(212) 503-5107

EASTERN

Al Di Guido - Associate Publisher/East Coast
(212) 503-5310

MA, NH, VT, ME, RI

District Manager
Kimberly Rene White
(617) 393-3055
10 President's Landing, Mystic Central
Medford, MA 02155
Account Representative
Todd Anderman
(212) 503-5132

CT, NY, NJ, PA

District Manager
Michael Bird
(212) 503-5307
District Sales Representative
Lisa Friedman
(212) 503-5149
One Park Avenue, 4th Floor
New York, NY 10016
Sr. Account Representative
Joyce Wasserman
(212) 503-5333
Account Representative
Stephanie Brzozowski
(212) 503-5675

DE, MD, DC, VA, WV, NC, SC, AL, MS, TN, AR, KY, GA, FL

District Manager
Scott J. Seltz
3405 Piedmont Road, Suite 460
Atlanta, GA 30305
(404) 239-9780

Account Representative
Andrew Jacobs
(212) 503 5130

CENTRAL

Robert Dittler - Central Advertising Manager
(312) 346-7666

NE, WI, IL, IN, KS, MN, MO, OH, MI, IA, ND, SD, Canada

District Manager
Stephen Dress
District Manager
Jay Overbye
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
(312) 346-7666
Account Representative
Maureen Dooley
(212) 503-5126
Sr. Account Representative
Beth Boyle
(212) 503-5047

TX, OK, LA, NM

District Manager
Paul Klein
5956 Sherry Lane, Suite 625
Dallas, TX 75225
(214) 691-6934
Account Representative
Karen Keavey
(212) 503-5104

WESTERN

CA (Los Angeles)

District Manager
Mary Arlotto (213) 351-1811
3530 Wilshire Boulevard, Suite 645
Los Angeles, CA 90010
(213) 351-1810
Account Representative
John DeSpirito
(212) 503-5040

WESTERN

Ted Welch - Associate Publisher/West Coast
(415) 378-5525

CA (San Francisco & North), ID, OR, WA

District Manager
Mike Kisseberth
(415) 378-5527
District Sales Representative
Rick Vandervoom (415) 378-5523
110 Marsh Drive, Suite 103
Foster City, CA 94404
Account Representative
Chris Sullivan
(212) 503-5129

CA (Santa Barbara to South San Francisco), WY, MT, AK, CO, UT

District Manager
Michael Klein (415) 378-5521
District Manager
Kim Dawson (415) 378-6859
110 Marsh Drive, Suite 103
Foster City, CA 94404
(415) 378-5520
Account Representative
John Zaterka
(212) 503-5041

CA (San Diego & Orange County), AZ, NV, HI

District Sales Manager
David Lynn
District Sales Manager
Robin Kofsky
18500 Von Karman Avenue
Suite 510
Irvine, CA 92715
(714) 852-8001
Senior Account Representative
Molly Shank
(212) 503-5113

For more information regarding *display advertising* please call:
(212) 503-5100 or
1-800-33MAG AD

CLASSIFIED ADVERTISING

VP, Classified Advertising
Paul Stafford

Classified Advertising Director
Vickie L. Pinsky

Sr. Advertising Coordinator
Wanda D. Brown

Production Director
Anne Brockinton

Production Supervisor
Bessi Dion

Production Coordinator
Mary C. Murawinski

CA (415, 619, 818)

Sr. Account Representative
Charles Boyar
212-503-5118

AZ, CA (209, 707), CO, ID, MO, NV, OH, OR, WA, CANADA, OVERSEAS

Sr. Account Representative
Kathleen Morris
212-503-5125

AR, CT, GA, ME, NC, NH, NJ, PA, RI, SC, VT

Louella Dizon
212-503-5145

IA, IL, IN, KS, MI, MT, NE, NY, UT, WY

Margaret Kennelly
212-503-5176

CA (714, 805, 916), FL, MA, MN, ND, NM, SD, WI

Mike Medwig
212-503-5193

CA (213, 408), HI

C. Wesley Walton
212-503-5117

AL, DC, DE, KY, LA, MD, MS, OK, TN, TX, VA, WV

212-503-5156

Business Card
Account Representative
Richard Wortman 212-503-5175



PC MAGAZINE MARKETPLACE
3rd Floor, One Park Avenue,
New York, NY 10016

For more information regarding *classified advertising* please call:
212-503-5115 or
1-800-825-4237

ADVERTISERS INDEX COMPANIES

R/S#	ADVERTISER	PAGE	R/S#	ADVERTISER	PAGE	R/S#	ADVERTISER	PAGE
293	3 Com	108-109	107	Everex	220-223	145	Paradise Computer Products Ltd	455
521	3M Data Storage Products	209	385	FASTMICRO	81-83	*	PC Brand	315-322
519	Acer America Corporation	145	352	FASTMICRO	432-435	*	PC Connection	272-277
360	Acma Computers, Inc	87	288	Fifth Generation	110	343	Performance Memory Products	454
165	Advanced Logic Research	2-3	382/320	First Source International	448	147	Plus Development	195
197	Advanced Micro Devices	439	323	Funk Software	257	148	Primavera Systems	98
*	Aldus Corporation	192-193	*	Gateway 2000	129-137	159	Prometheus	98
199	Amaze, Inc	343	146	Gateway Communications	231	259	QMS	43
251	Apple Computer	6-7	*	Hard Drives International	449	141	QMS	45
208	APS Technologies	457	276	Hauppauge Computer Works, Inc	34	*	Radio Shack	139
336	Arlington Computer Products	442-443	388	Hayes Microcomputer Products	96	289	Radio Shack	141
254	Artisoft	266	136	Hayes Microcomputer Products	269	234	Radius	106-107
*	Ashton-Tate	94-95	313	Helix Software	51	290	Rose Electronics	389
*	Ashton-Tate	326-327	218	Hewlett Packard Peripheral Group	252-253	476	Roykore, Inc	372
337	ATI Technologies Inc	90	525	Hyundai	206	124	Roykore, Inc	374
509	Austin Computers	11-15	514	IBM Corp	26-27	296	SAMTRON	28
130	BASF Corp	72	*	IBM Corp	114-115	*	Scitor Corporation	104
287	Borland International	63	*	IBM Corp	190-191	*	Seagate	390
285	Borland International	65	272	In Focus Systems, Inc	258	740	Sierra Semiconductor	251
328	Buffalo Products	427	*	Insight Computers	306-307	160	Sigma Data	180
481	Bulldog Computer Products	436	355	Intel Corporation	126	373	Software Add-Ons	440
180	Bureau of Electronic Publishing	334	176	Intel Corporation	214-215	393	Software Link, Inc	80
187	Canon, USA	47	363	Intel Corporation	406	377	Sony Magnetic Products Co	54-55
155	Canon, USA	173	127	JDR Microdevices	437	*	Spectragraphics Corporation	256
151	Capital Equipment Corporation	197	493	LA Trade	454	731	Stac Electronics	202-205
319	Cardinal Technologies	99	171	LANtek Computer, Inc	450	163	Standard Computer	127
162	Central Point Software	59	237	LaserMaster	332-333	485/496	StatSoft	53
238	Club Computer Corp	422	108	Logitech	210-211	365	STSC	261
516	CMO	150	*	Lotus Development Corp	159-162	*	Swan Technologies	399-402
*	CompuAdd	239-446	*	Lotus Development Corp	166-167	264	Symantec	22
*	CompuAdd	335	189	Lotus Development Corp	168-169	344	Symantec	328-329
205	Compuclassics	445	263	Macola Inc	196	206	Telemart	100-103
132	COMPU DYNE	234-236	*	Mark Williams	312	306	Tenex Computer Express	448
300	Computability	441	154/491	MathSoft Inc	267	304	Texas Instruments	84
381	Computer Associates	5	499	MCI Mail	142-143	353	Texas Instruments	254
109	Computer Discount Warehouse	446-447	104	Microcom	260	161	Texas Micro	380-283
529	Computer Library	431	*	Micrografx	375	311	The Computer Book Club	451-453
183	Computer Library	489	*	MicroLab	4	379	Toshiba of America	310-311
158	Computer Library	499	*	Microsoft	92	533	TOUCHE	157
105	Computer Peripherals Inc	23	*	Microsoft	C2-C4, p1	121	Tri-Star Computer	19
315	Concentric Data Systems	282	*	Microsoft	366	515	Truevision Inc	412
372	Copam U.S.A., Inc	198	225	MicroWarehouse Inc	152-155	231	U.S. Robotics, Inc	336-337
729	Corel Systems	369	489	Midwest Computer Works	444	367	Universal Data Systems	428
541	Creative Labs, Inc	67	143	Motorola Semiconductor	324-325	191	USA Flex	68-69
278	DCA Crosstalk	20-21	120	Mouse Systems	248	247	Ventura Software Inc	39-41
389	DCA	373	*	Multiple Zones, Inc	262-265	118	ViewSonic	183
536	Dell Computer Corporation	C5-C8	283	Nanao, USA Corp	347	*	Wordperfect	76-77
502	Dell Computer Corporation	174-175	375	NEC Technologies, Inc	74	732	Zenith Data Systems	302-303
470	Dell Computer Corporation	176-177	217	NEC Technologies, Inc	147-149	488	Zeos International	24-25
480	Dell Computer Corporation	178-179	157	NEC Technologies, Inc	304	722	Zeos International	31
*	Dell Computer Corporation	503-504	*	NEC Technologies, Inc	330-331	723	Zeos International	32-33
745	Digital Products	73	329	Nikon, Inc	224	513	Zeos International	78
239	Digital Research	228-229	194/327	Northgate Computer Systems	289-291	721	Zeos International	88-89
*	Dow Jones Information Services	501	207	Northgate Computer Systems	292-293	492	Zeos International	187
102	DTK Computers	70	243	Northgate Computer Systems	294-295	*	Zeos International	355-364
347	Dustin Discount Software	16	368	Northgate Computer Systems	296	115	Zeos International	365
484	Dustin Discount Software	18	*	Northgate Computer Systems	297-298	*	Zeos International	48a-I
196	Eastman Kodak	80	750	Norton-Lambert	57	387	Ziff-Davis Press	456
362	Eastman Kodak	281	235	Okidata	184-185	494	Ziff-Davis Press	458
227	Egghead Discount Software	376	133	On Track Computer Systems	259	175	ZSoft	338
284	EPS Technologies	118-119	245	Output Technology	301			
294	ET Valueline	438	*	Pacific Data Products	212			
113	Everex	218-219	140	Panasonic Comm. & Systems Co	232			

* No Reader Service #. Please Call Advertiser For Information.

ADVERTISERS' INDEX PRODUCTS BY CATEGORY

R/S# ADVERTISER

PRODUCT

PAGE#

R/S# ADVERTISER

PRODUCT

PAGE#

ACCOUNTING SOFTWARE

263 Macola Inc.
373 Software Add-Ons

DATA BASE MANAGERS

* Ashton-Tate
285 Borland International
315 Concentric Data Systems

INFORMATION MANAGERS

315 Concentric Data Systems

LANGUAGES

* Mark Williams

OPERATING SYSTEMS/ENVIRONMENTS

239 Digital Research
Mark Williams
383 Software Link, Inc.

PROGRAM DEVELOPERS/GENERATORS

287 Borland International

PROJECT MANAGEMENT

* Microsoft
146 Primavera Systems
* Solor Corporation

STATISTICAL SOFTWARE

154/491 MathSoft Inc.
485/496 StatSoft
365 STSC

UTILITIES

162 Central Point Software
315 Concentric Data Systems
286 Fifth Generation
323 Funk Software
313 Helix Software
750 Norton-Lambert
373 Software Add-Ons
264 Symantec
344 Symantec

WORD PROCESSING SOFTWARE/AIDS

315 Concentric Data Systems
189 Lotus Development Corp.
* Pacific Data Products
373 Software Add-Ons

SPREADSHEET/TEMPLATES

323 Funk Software
* Lotus Development Corp.
* Microsoft

DESK TOP PUBLISHING

* Aldus Corporation
* Pacific Data Products
247 Ventura Software Inc.
247 Ventura Publisher

VERTICAL MARKET SOFTWARE

154/491 MathSoft Inc.
731 Stac Electronics
485/496 StatSoft

FONT SOFTWARE

* Pacific Data Products

PRESENTATION SOFTWARE

381 Computer Associates

DIAGNOSTIC SOFTWARE

133 On Track Computer Systems

MAPPING SOFTWARE

484 Dustin Discount Software

FLOWCHARTING

476 Roykore, Inc.
124 Roykore, Inc.

WINDOWS SOFTWARE

287 Borland International
381 Computer Associates
189 Lotus Development Corp.
Lotus Development Corp.
154/491 MathSoft Inc.
* Microsoft
* Microsoft
750 Norton-Lambert
124 Roykore, Inc.
476 Roykore, Inc.
373 Software Add-Ons
Spectragraphics Corporation

DATA COMPRESSION SOFTWARE

731 Stac Electronics

Accounting Software 196
Mail Order 440

dBase IV 1.1 94-95
Paradox 65
R&R Relational Report Writer 282

R&R Relational Report Writer 282

Coherent Unix Operating System 312

DR. DOS 228-229
Coherent Unix Operating System 312
PC-MOS 80

Turbo Pascal Windows 63

Project for Windows 366
Primavera Project Planner 98
Project Scheduler 104

Mathcad 3.0 267
Statistical Software 53
Statgraphics 261

Anti-Virus 59
R&R Relational Report Writer 282
Direct Access 110
Sideways 257
Netroom 51
Close-Up 57
Mail Order 440
Desktop for Windows 22
Utilities 328-329

R&R Relational Report Writer 282
Ami Pro 2.0 168-169
Pacific Page XL 212
Mail Order 440

Sideways 257
Lotus 1-2-3 for Windows 159-162
Excel 3.0 C2-C4, p1

Windows Page Maker 192-193
Pacific Page XL 212
Color Extensions 39-41
Ventura Publisher 39-41

Mathcad 3.0 267
Stacker 202-205
Statistical Software 53

Pacific Page XL 212

Cricket Presents 5

Anti Virus Software 259

Mapping Software 18

Instant ORGcharting! 372
ABC Flowchart 374

Turbo Pascal Windows 63
Cricket Presents 5
Ami Pro 2.0 168-169
Lotus 1-2-3 for Windows 159-162
Mathcad 3.0 267
Excel 3.0 C2-C4, p1
Project for Windows 366
Close-Up 57
ABC Flowchart 374
Instant ORGcharting! 372
Mail Order 440
PC-X View 256

Stacker 202-205

ORGANIZATIONAL CHART SOFTWARE

476 Roykore, Inc. Instant ORGcharting! 372

ANTI-VIRUS SOFTWARE

162 Central Point Software Anti-Virus 59
104 Microcom Virex 280
133 On Track Computer Systems Anti Virus Software 259

DISK BACKUP & TAPE DRIVES

521 3M Data Storage Products Data Storage Products 209
* Seagate Drives 390

HARD DISKS

147 Plus Development Hard Card 195
731 Stac Electronics Stacker 202-205

COMPUTERS/COMPATIBLES

519 Acer America Corporation 486 145
360 Acma Computers, Inc. Acma PC's 87
165 Advanced Logic Research Business STATION 486 PC's 2-3
336 Arlington Computer Products Mail Order 442-443
509 Austin Computers PC's 11-15
481 Bulldog Computer Products Compatibles 436
236 Club Computer Corp. Compatibles 422
516 CMO Mail Order 150
* CompuAdd Multi-Media Hardware 339-348
132 COMPUTADYNE Hardware, Software, Peripherals 234-236
300 Computability Mail Order 441
109 Computer Discount Warehouse Compatibles 446-447
372 Copam U.S.A., Inc. PC's 198
536 Dell Computer Corporation Dell PC's C5-C8
502 Dell Computer Corporation Dell PC's 174-175
470 Dell Computer Corporation Dell PC's 176-177
480 Dell Computer Corporation Dell PC's 178-179
* Dell Computer Corporation Dell PC's 503-504
102 DTK Computers Computers/Compatibles 70
294 ET ValueLine Compatibles 438
113 Everex STEP Computer Systems 218-219
107 Everex STEP Computer Systems 220-223
385 FASTMICRO PC's 81-83
352 FASTMICRO PC's 432-435
* Gateway 2000 Compatibles 129-137
525 Hyundai PC's 206
* IBM Corp. PS/2 114-115
* Insight Computers Computers/Compatibles 306-307
171 LANtek Computer, Inc. Compatibles 450
* MicroLab Compatibles 4
* Multiple Zones, Inc. Compatibles 262-265
194/327 Northgate Computer Systems Compatibles 289-291
207 Northgate Computer Systems Compatibles 292-293
234 Northgate Computer Systems Compatibles 294-295
368 Northgate Computer Systems Compatibles 296
* Northgate Computer Systems Compatibles 297-298
145 Parallel Computer Products Ltd PC's 455
* PC Brand PC's 315-322
* Radio Shack Computers 139
289 Radio Shack Computers 141
163 Standard Computer PC's 127
* Swan Technologies Mail Order 399-402
Telemart PC's 100-103
306 Tenex Computer Express Mail Order Memory Products 448
379 Toshiba of America Notebook 310-311
533 TOUCHE Compatibles 157
121 Tri-Star Computer Computers/Compatibles 19
191 USA Flex Compatibles 68-69
732 Zenith Data Systems Systems 302-303
488 Zeos International Zeos Notebook 24-25
722 Zeos International Compatibles 31
* Zeos International Compatibles 48a-1
513 Zeos International Compatibles 78
721 Zeos International Compatibles 88-89
492 Zeos International Compatibles 187
* Zeos International Compatibles 355-364
115 Zeos International Z-Card 365

INPUT DEVICES

108 Logitech Logitech Input Devices 210-211
120 Mouse Systems PageBrush256 Grayscale Scanner 248

PROGRAMMERS TOOLS UTILITIES

287 Borland International Turbo Pascal Windows 63
* Mark Williams Coherent Unix Operating System 312

MULTIFUNCTION BOARDS

541 Creative Labs, Inc. Sound Blaster 67

ADD-ON BOARDS

208 APS Technologies Mail Order 457
541 Creative Labs, Inc. Sound Blaster 67
276 Hauppauge Computer Works, Inc. N Series Motherboards 34
355 Intel Corporation Memory Board 126
383 Intel Corporation Memory Board 406
237 LaserMaster Pro Printer Controller 332-333
180 Sigma Data Add-on-Boards 180

ADVERTISERS' INDEX

PRODUCTS BY CATEGORY

R/S#	ADVERTISER	PRODUCT	PAGE#	R/S#	ADVERTISER	PRODUCT	PAGE#
515	Truevision Inc	Video Graphics Boards	412				
SCANNERS DIGITIZERS				DISPLAYS MONITORS TERMINALS			
218	Hewlett Packard	Peripheral Group ScanJet IIC	252-253	516	CMO	Mail Order	150
108	Logitech	Logitech Input Devices	210-211	372	Copam U.S.A., Inc	Monitors	198
120	Mouse Systems	PageBrush256 Grayscale Scanner	248	272	In Focus Systems, Inc	1600 LC Projection Panel	258
329	Nikon, Inc	LS-3510AF Scanner	224	283	Nanao, USA Corp	Monitor	347
PRINTERS				217	NEC Technologies, Inc	MultiSync Monitors	147-149
187	Canon, USA	Laser Beam Printers	47	234	Radius	Monitors	106-107
516	CMO	Mail Order	150	296	SAMTRON	Monitor	28
196	Eastman Kodak	Diconix Printers	60	118	ViewSonic	VGA Monitor	183
362	Eastman Kodak	Ektaplug 7106 Printer	281	GRAPHICS SOFTWARE			
237	LaserMaster	Pro Printer Controller	332-333	*	Ashton-Tate	Draw Applause II	326-327
375	NEC Technologies, Inc	Colormate PS40	74	381	Computer Associates	Cncket Presents	5
*	NEC Technologies, Inc	Printers	330-331	729	Corel Systems	Corel Draw	369
235	Okidata	LED Page Printers	184-185	*	Lotus Development Corp	Freelance Graphics	166-167
245	Output Technology	EuroLine	301	*	Micrograph	Designer	375
140	Panasonic Comm. & Systems Co	Dot Matrix Printer	232	175	ZSoft Publishers	Paintbrush	338
259	QMS	Laser Printers	43	VIDEO GRAPHICS BOARDS			
141	QMS	Laser Printers	45	337	ATI Technologies Inc	8514 - ULTRA	90
290	Rose Electronics	Printer Sharing Switches	389	515	Truevision Inc	Video Graphics Boards	412
353	Texas Instruments	MicroLaser	254	COMMUNICATIONS SOFTWARE			
WORKSTATIONS				278	DCA Crosstalk	Crosstalk	20-21
514	IBM Corp	RISC 6000	26-27	388	Hayes Microcomputer Products	Smartcom Exec	.96
PRINTER ACCESSORIES				750	Norton-Lambert	Close-Up	57
328	Buffalo Products	Printer Sharing Solutions	427	290	Rose Electronics	Communications Software	389
745	Digital Products	Print Director	73	*	Spectragraphics Corporation	PC-X View	256
237	LaserMaster	Pro Printer Controller	332-333	367	Universal Data Systems	Communications Software	428
245	Output Technology	EuroLine	301	*	Wordperfect	WordPerfect Office	76-77
*	Pacific Data Products	Pacific Page XL	212	LOCAL AREA NETWORKING			
HIGH RESOLUTION PRINTER BOARDS				293	3 Com	Ether-Link	108-109
237	LaserMaster	Pro Printer Controller	332-333	254	Artisoft	Lantastic	266
MULTI-MEDIA				389	DCA	Imratrac Token-Ring	373
*	CompuAdd	Multi-Media Hardware	335	146	Gateway Communications	Ethernet Board	231
PORTABLE LAP COMPUTERS				*	IBM Corp	Networking Solutions	190-191
516	CMO	Mail Order	150	171	LANtek Computer, Inc	ARCnet, Ethernet, Token Ring	450
*	CompuAdd	Laptops	339-346	171	LANtek Computer, Inc	T1, Link 64, Bridges, Remotes	450
502	Dell Computer Corporation	Laptops	174-175	171	LANtek Computer, Inc	Novell NetWare, Lantastic	450
284	EPS Technologies	Compatibles	118-119	*	Microsoft	NBU Line	92
294	ET ValueLine	Laptops	438	290	Rose Electronics	Peripheral Sharing Switches	389
113	Everex	STEP Computer Systems	218-219	393	Software Link, Inc	PC-MOS	80
107	Everex	STEP Computer Systems	220-223	*	Spectragraphics Corporation	PC-X View	256
*	Insight	Computers Notebooks	306-307	MODEMS			
*	Multiple Zones, Inc	Laptops	262-265	319	Cardinal Technologies	Modems	99
194/327	Northgate Computer Systems	Compatibles	289-291	105	Computer Peripherals Inc	Viva Modem 9600	23
207	Northgate Computer Systems	Compatibles	292-293	136	Hayes Microcomputer Products	Optima 96 Modem	269
243	Northgate Computer Systems	Compatibles	294-295	159	Prometheus	Promodem 24/9600 Fax	96
368	Northgate Computer Systems	Compatibles	296	740	Sierra Semiconductor	FAX-PC	251
*	Northgate Computer Systems	Compatibles	297-298	231	U.S. Robotics Inc	Portable Modem	336-337
289	Radio Shack	Portables Laptops	141	367	Universal Data Systems	Modems	428
*	Radio Shack	Portables Laptops	139	MULTIUSER SYSTEMS			
304	Texas Instruments	Travelmate	84	*	Mark Williams	Coherent Unix Operating System	312
379	Toshiba of America	Notebook	310-311	290	Rose Electronics	Master Switch	389
732	Zenith Data Systems	Laptops	302-303	PERIPHERAL SHARING DEVICE			
488	Zeos International	Zeos Notebook	24-25	328	Buffalo Products	Printer Sharing Solutions	427
PC-FAX				290	Rose Electronics	Master Switch	389
740	Sierra Semiconductor	FAX-PC	251	REMOTE COMPUTING			
367	Universal Data Systems	Fax	428	750	Norton-Lambert	Close-Up	57
CO-PROCESSORS				DISKETTES			
161	Texas	Micro Co-Processor	380-283	521	3M Data Storage Products	Data Storage Products	209
OPTICAL PERIPHERALS				130	BASF Corp	Diskettes	72
*	Multiple Zones, Inc	Software	262-265	377	Sony Magnetic Products Co	Data Cartridges	54-55
MEMORY				SECURITY			
151	Capital Equipment Corporation	Add-in-Boards	197	133	On Track Computer Systems	Anti Virus Software	259
382/320	First Source International	Memory	448	PC ACCESSORIES			
127	JDR Microdevices	Memory	437	731	Stac Electronics	Stacker	202-205
343	Performance Memory Products	Memory	454	RETAIL DISTRIBUTORS			
160	Sigma Data	Memory Upgrades	180	227	Egghead Discount Software Lotus	Promotion	376
306	Tenex Computer Express Mail Order	Memory Products	448	tk	Radio Shack	Retail Distributors	139
TIME MANAGEMENT SOFTWARE				289	Radio Shack	Retail Distributors	141
199	Amaze, Inc	Calendaring Software	343	360	Acoma Computers, Inc	Acoma PC's	87
CD-ROM				208	APS Technologies	Mail Order	457
180	Bureau of Electronic Publishing	CD-ROM	334	336	Arlington Computer Products	Mail Order	442-443
183	Computer Library	Select Demo's	489	509	Austin Computers	Mail Order	11-15
158	Computer Library	Computer Select	499	481	Bulldog Computer Products	Mail Order Products	436
157	NEC Technologies Inc	CD-ROM	304	238	Club Computer Corp	Mail Order	422
CHIPS PROCESSORS				516	CMO	Mail Order	150
197	Advanced Micro Devices	Co-Processor	439	*	CompuAdd	Mail Order	339-346
176	Intel Corporation	Co-Processor	214-215	205	Compuclassics	Mail Order Products	445
143	Motorola	Semiconductor Chip Set	324-325	132	COMPU DYNE	Hardware, Software, Peripherals	234-236
MASS STORAGE				300	Computability	Mail Order	441
208	APS Technologies	Mail Order	457	109	Computer Discount Warehouse	Mail Order	448-447
*	Hard Drives International	Mass Storage	449	536	Dell Computer Corporation	Dell PC's	C5-C8
				502	Dell Computer Corporation	Dell PC's	174-175

470	Dell Computer Corporation
480	Dell Computer Corporation
*	Dell Computer Corporation
347	Dustin Discount Software
294	ET ValueLine
352	FASTMICRO
385	FASTMICRO
382/320	First Source International
*	Gateway 2000
*	Gateway 2000
*	Hard Drives International Mail
*	Insight Computers
127	JDR Microdevices
493	LA Trade
171	LANtek Computer, Inc.
*	MicroLab
225	MicroWarehouse Inc.
489	Midwest Computer Works
*	Multiple Zones, Inc.
194/327	Northgate Computer Systems
207	Northgate Computer Systems
243	Northgate Computer Systems
388	Northgate Computer Systems
*	Northgate Computer Systems
145	Paradise Computer Products Ltd
*	PC Brand
*	PC Connection
343	Performance Memory Products
373	Software Add-Ons
183	Standard Computer
*	Swan Technologies
206	Telamart
306	Tenex Computer Express
520	TOUCHE
191	USA Flex
486	Zaos International
722	Zaos International
723	Zaos International
*	Zaos International
513	Zaos International
721	Zaos International
721	Zaos International
492	Zaos International
*	Zaos International
115	Zaos International

ON LINE DATABASE

529	Computer Library
*	Dow Jones Information Services

ELECTRONIC MAIL

499	MCI Mail
-----	----------

BOOKS

311	The Computer Book Club
387	Ziff-Davis Press
494	Ziff-Davis Press

APPLE PRODUCTS

251	Apple Computer
-----	----------------

UNIX PRODUCTS

*	Mark Williams
*	Spectrographics Corporation

MISCELLANEOUS

155	Canon, USA
272	In Focus Systems, Inc.

DIRECT MARKETING CONNECTION

197	Advanced Micro Devices
208	APS Technologies
336	Arlington Computer Products
461	Bulldog Computer Products
205	Compuclassics
300	Computability
109	Computer Discount Warehouse
294	ET ValueLine
352	FASTMICRO
382/320	First Source International
*	Hard Drives International
127	JDR Microdevices
493	LA Trade
171	LANtek Computer, Inc.
489	Midwest Computer Works
145	Paradise Computer Products Ltd
343	Performance Memory Products
373	Software Add-Ons
306	Tenex Computer Express

Dell PC's	176-177
Dell PC's	178-179
Dell PC's	503-504
Mail Order Products	16
Mail Order	438
Mail Order	432-435
Mail Order	61-83
Mail Order	448
Keyboards, Compatibles, Monitors	129-136
Mail Order	137
Order	449
Mail Order	306-307
Mail Order	437
Mail Order	454
Networking Products	450
Mail Order	4
Mail Order	132-155
Mail Order	444
Mail Order	262-265
Mail Order	269-291
Mail Order	292-293
Mail Order	294-295
Mail Order	296
Mail Order	297-298
Mail Order	455
Mail Order	315-322
Mail Order	272-277
Mail Order	454
Mail Order	440
Mail Order	127
Mail Order	399-402
Mail Order	100-103
Mail Order Memory Products	446
Compatibles	157
Compatibles	66-69
Zaos Notebook	24-25
Mail Order	31
Compatibles	32-33
Compatibles	48-1
Compatibles	78
Compatibles	88-89
Z-Card	88-89
Mail Order	187
Compatibles	355-364
Z-Card	365

Ziff Net	431
Dow Jones New Retrieval	501

E-Mail	142-143
--------	---------

Books	451-453
Books	456
Books	458

Apple Products	6-7
----------------	-----

Coherent Unix Operating System	312
PC-X View	256

Color Laser Copier 300	173
1600 LC Projection Panel	258

Co-Processor	439
Mail Order	457
Mail Order	442-443
Mail Order, Compatibles	436
Mail Order Products	445
Mail Order	441
Mail Order, Compatibles	446-447
Mail Order	438
Mail Order, PC's	432-435
Mail Order, Memory	448
Mail Order, Mass Storage	449
Mail Order, Memory	437
Mail Order	454
Mail Order	450
Mail Order	444
Mail Order, PC's	455
Mail Order, Memory	454
Mail Order	440
Mail Order Memory Products	448

■ GRAPHICAL WORD PROCESSING: TIPS AND TRICKS

Contributing editor Edward Mendelson explains the benefits and pitfalls of graphical word processors and how to get the most out of GUI environments when you create documents. Helpful hints for *Ami Pro*, *JustWrite*, *Legacy*, *Microsoft Word for Windows*, and *ProWrite Plus* will get you started. Also, a sneak preview of *WordPerfect for Windows*, the graphical version of the number one word processor.

■ HAND SCANNERS

Don't have the desktop real estate for a page scanner, or don't want to incur the extra expense? Maybe it's time to think about a hand scanner—half the price and a fraction of the workspace. Expect to make some sacrifices, however, and be sure to practice keeping that scanner straight! *PC Magazine* rounds up a dozen popular brands for both color and gray scale and tells you which scanner is the handiest of them all.



■ INEXPENSIVE 386SXs

A first-time buyer need not spend thousands of dollars for a business-level PC. These 11 386SX-based systems offer a computing option that's affordable for most users, ready for *Windows*, and backed by on-site service, too. *PC Magazine* Labs tests 16- and 20-MHz 386SX PCs that cost less than \$1,600, from C² Micro Systems, HiQuality Systems, International Instrumentation, Iverson Computer, Matrix Digital Products, Micro Express, Transource, Treasure Chest, and USA Flex.

■ ISSUE 19 ENDURANCE TESTS

As portable computing edges toward market dominance, the gray area between what your desktop computer and your laptop can do has been substantially increased. *PC Magazine*'s staff takes 13 of the March 12, 1991, issue's best transportables for an extended road test, in which we put these systems through the daily grind of the publishing world and determine how well these diminutive marvels measure up to their deskbound siblings.

■ CONNECTIVITY

Document-management software keeps track of the myriad files and versions of files that exist on every network. They can prove to be essential tools for locating that elusive file, allowing users to search in a variety of ways, ranging from author to date to category. They also make archiving files a less cumbersome task for the already overburdened network administrator. The connectivity team reviews four application-independent software packages from Interpreter, PC Docs, Soft Solutions, and Wang that sort out who, when, what, and which version.

For Additional Product Categories See
MARKETPLACE PRODUCT INDEX Page 481.

READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE	READER SERVICE NUMBER	PRODUCT	COMPANY	PAGE
AFTER HOURS				619	LMSI CM 231	Laser Magnetic Storage International Co.	325	399	Data Physician Plus, Version 1.3C	Digital Dispatch Inc.	217
427	CompuServe	CompuServe Information Service	496	431	MicroPorte 1042	Microcom	46	405	SafeWord Virus-Safe, Version 1.12	Enigma Logic Inc.	238
428	Dow Jones News/Retrieval	Dow Jones & Co.	496	620	NEC Intersect CDR-73	NEC Technologies Inc.	326	449	ExtendBase for NetWare 386	Extended Systems	56
426	GEie	GE Information Services	496	436	NEC MultiSync 4FG	NEC Technologies Inc.	61	402	Mace Vaccine, Version 3.0	Fifth Generation Systems	233
424	Prodigy	Prodigy Services Co.	496	438	Nikon LS-351DAF	Nikon Electronic Imaging	62	437	GeoWorks Ensemble	GeoWorks Inc.	61
425	America Online	Quantum Computer Services Inc.	496	446	Argon-8	Pacific Semiconductor	66	410	VirusCure Plus, Version 2.24	IMSI	256
COMPUTERS (Upgradables)				621	PLI CD-ROM Drive	Peripheral Land Inc.	327	412	Virus-Pro, Version 2.1	International Security Technology Inc.	267
604	ALR BusinessVEISA	Advanced Logic Research Inc.	121	622	Allegro Series, Model PXCD650S	Procom Technology Inc.	330	411	Virus Guard	IP Technologies	260
605	ALR Modular Processor System	Advanced Logic Research Inc.	128	443	Full Page Pivot	Radius Inc.	62	709	1-2-3 for Windows, Version 1.0	Lotus Development Corp.	35
606	ALR SX PowerFlex	Advanced Logic Research Inc.	128	623	Sony CDU-7205	Sony Corp. of America	331	409	Viruscan, Version 77	McAfee Associates	255
607	Amkty 386/25e	Amkty Systems Inc.	144	623	Sony CDU-7211	Sony Corp. of America	331	407	Virex-PC, Version 1.1a	Microcom Inc.	247
440	Aquiline NT33	Aquiline Inc.	62	624	Tandy CDR-1000 CD-ROM Drive	Tandy Corp.	333	400	Dr. Solomon's Anti-Virus Toolkit, Version 5.0	Ontrack Computer Systems Inc.	217
701	AST Premium Exec 386SX/25	AST Research Inc.	44	625	Texel DM-5021	Texel America Inc.	334	404	Panda Pro, Version 1.1	Panda Systems	237
608	AST Premium II	AST Research Inc.	146	626	Todd TCDR-6000	Todd Enterprises Inc.	336	408	VirusCide, Version 2.01	Parsons Technology Inc.	247
710	Compaq Deskpro/M Family: Deskpro 386/25m, 486s/16m, 486s/25m, 486/33m	Compaq Computer Corp.	35	627	Toshiba TXM-3301-E1	Toshiba America Information Systems Inc.	338	441	PackRat, Version 4.0	Polaris Software	62
609	Copam B Series	Copam Inc.	156	448	Personal Digital Workstations	Turtle Beach Systems	66	444	Superbase 4 Windows, Version 1.3	Precision Software Publishing Corp.	64
610	Dell System 333P	Dell Computer Corp.	163	430	VideoLogic Mediator	VideoLogic Corp.	58	702	QEMM-386, Version 6.0	Quarterdeck Office Systems Inc.	52
703	Dolch P.A.C. 486-50E	Dolch Computer Systems	56	PRINTERS				415	Vi-Spy, Version 6.0	RG Software Systems Inc.	278
611	Everex STEP 386 with InSTEP 486	Everex Systems Inc.	164	435	AcerLaser IIIG	Acer Inc.	61	401	Flu...Shot Plus, Version 1.82	Software Concepts Design	225
612	Reply Model 32	Reply Corp.	170	442	WinPrinter	LaserMaster Corp.	64	403	The Norton AntiVirus, Version 1.5	Symantec Corp.	233
613	Tandon Option	Tandon Corp.	171	705	IBM Model 4029-040 Laser Printer 10L	Lexmark International Inc.	42	396	AntiVirus Plus, Version 3.6	Techmar Computer Products Inc.	208
707	Toshiba T2200SX	Toshiba America Information Systems Inc.	44	READ ONLY				433	VentanaDraw, Version 1.2	VentanaWorks	50
COMPUTERS (Upgrade Boards)				418	Novell NetWare Power Tools	Bantam Computer Books	71	447	Ventura Database Publisher	Ventura Software Inc.	66
419	StaX SX	Aox Inc.	186	417	The DOS 5 User's Handbook	Sybex Inc.	71	406	Vaccine, Version 3.3	WorldWide Software Inc.	238
420	Cumulus 386SX Card	Cumulus Corp.	189	416	The Waite Group's Fractal Creations	Waite Group Press	71	413	VirusSafe, Version 4.01	XTree Co.	250
421	SnapIn 386	Intel Corp.	193	SOFTWARE				432	ZyINDEX for Windows, Version 4.1	ZyLAB	56
422	SX-Now!	Kingston Technology Corp.	194	414	Virus Secure for Windows, Version 1.03	Abacus	268	TOOLKITS			
423	FASTCache-SX	Microway Inc.	197	434	WinDraw	Addison Research	50	695	MultiScope Debuggers for Windows, Version 1.01	MultiScope Inc.	75
423	FASTCache-SX/Plus	Microway Inc.	197	450	BeyondMail	Beyond Inc.	48				
GRAPHICS				700	PC-File, Version 6.0	ButtonWare Inc.	52				
601	Arts and Letters Graphics Editor, Version 3.1	Computer Support Corp.	346	397	Central Point Anti-Virus, Version 1.0	Central Point Software	213				
602	CorelDRAW, Version 2.0	Corel Systems Corp.	349	398	Certus, Version 2.1	Certus International Corp.	216				
550	Digital Research Artline, Version 2.0	Digital Research Inc.	368	PRODUCTIVITY							
603	Designer, Version 3.1	Micrografix	351								
HARDWARE											
704	Xircom Pocket Ethernet Adapter	Calabazas	66								
614	CD Porta-Drive Model T3201	CD Technology Inc.	299								
615	Chinon CDX-431	Chinon America Inc.	305								
445	DoveFax for DOS	Dove Computer Corp.	64								
705	TruePoint	DP-Tek	66								
708	Dycam Model 1 Digital Still Camera	Dycam Inc.	49								
616	GenSTAR 2000	Genesis Integrated Systems Inc.	314								
617	Hitachi CDR-1750S	Hitachi Home Electronics America	323								
618	IBM PS/2 External CD-ROM Drive	IBM Corp.	324								

After Hours

Products for the Leisure Side of Personal Computing

Managing Your Money via Modem: On-line Services Help You Prosper

PERSONAL FINANCE by Don Irvine

Most people think of on-line services as places to chat with other PC users or as sources of free software.

Serious investors have known for years that on-line services provide great help in making and managing money.

But casual investors can also get a lot of help in managing their small portfolios of stocks and mutual funds, with just a little bit of effort.

This roundup looks at and rates the leading on-line services in their usefulness to the small investor.

PRODIGY

Prodigy, founded in 1988 as a joint venture by Sears Roebuck and IBM, was the first consumer-oriented information network to offer flat-rate pricing—currently \$13 per month (less on an annual basis). Pricing and entertainment features have made Prodigy the most popular of the general-purpose information services; in June it added its 1 millionth subscriber.

Access is through Prodigy's own network located in major cities across the country, and

**ON-LINE FINANCIAL SERVICES:
SUITABILITY TO TASK**

PC Magazine rates each on-line service for its usefulness as a source of stock quotes, as a source of research material on potential investments, and as a source of news. There is also a rating of the portfolio management functions, if any, that each service provides.

Collecting quotes refers to the availability of real-time or delayed stock price quotes, with emphasis on ease of access.	Portfolio management refers to the organizational and analytical features, if any, that each service provides to help investors track their stock portfolios.
Investor research rates the amount of background and financial information on potential investments that each service provides (if any).	
The news rating considers the quality and timeliness of business and investment news provided by each service.	

SCALE:
1—Poor
2—Fair
3—Good
4—Excellent
N/A—Not applicable:
The product does not perform this task.

through the Tymnet telecommunications network in more remote areas. Custom communications software is provided by Prodigy as part of the subscription price.

Billed as an information service for noncomputer people, Prodigy lives up to its advertising fairly well. Bright, colorful graphics give it the flavor of a *USA Today*-style newspaper; the advertising that appears on most screens further enhances the newspaper imagery. Although everyone dislikes the ads, they help pay the bills and keep subscription rates low. Mouse support and pull-down menus add to the ease of use.

Prodigy's financial services are organized under the "Money" heading on the main menu. The offerings include: News and Markets, News Features, Credit/Loan Services, Insurance, Banking, Investments, Real Estate, and Resources.

News and Markets provides breaking stories in business and economics that will interest any investor. Included are Quote Check and Quote Track functions that access the Dow Jones News/Retrieval gateway to give you 15-minute delayed securities quotes using either the ticker symbol or the company name. Quote Check is for single quotations, while Quote Track lets you price one or two lists of securities—each list containing a maximum of 15 stocks, bonds,

PERSONAL FINANCE
In this special After Hours, we take a look at the financial management tools offered by the five major on-line services.

or mutual funds. Screen output is in a bold easy-to-read font showing last change and volume. Unfortunately, there is no way to download information to a file for manipulation with a spreadsheet or other analysis program; you can, however, print a hard copy. The track function is decidedly low tech—editing is done by deleting and reentering data—but that's not necessarily bad; it's easy to use, clear, and gets the job done.

Quote Track is useful, but it doesn't go far enough. There should be a portfolio management function that lets you enter the number of shares you own along with a purchase price, and gives you an up-to-date evaluation and analysis of profit/loss in a particular stock.

Also part of the News and Markets section are several electronic newsletters such as Kiplingers, Julian Block on taxes, and an investment digest. I found these to be heavily self-promotional, but some investors may find them to be of value.

Most of the Money menu's investment options are disappointing. Topics like Dean Witter Reynolds, Dreyfus, IDS, and Twentieth Century are little more than advertisements for brokerage houses and mutual funds (You can fill out an on-line request to order additional information.) The most useful feature

CONTINUES

SUITABILITY TO TASK

Prodigy

Collecting quotes	2		
Investor research	1		
News	2		
Portfolio management	N/A		

After Hours

On-line Finance

CONTINUED

in the investment section is PCFN (Personal Control Financial Network), which provides on-line discount stock trading. It allows you to place orders 24 hours a day directly with the brokerage firm of Donaldson, Lufkin, and Jenrette.

The bulk of Prodigy's research information is contained in an optional pay-to-use pro-



Prodigy's graphics menus are always easy to follow—something that can't be said about every on-line service.

duct called Strategic Investor. For \$15 a month you have access to 4,800 stock reports and 2,500 mutual fund reports as well as

Prodigy news summaries like NYSE Today and The Week Ahead. I found the mutual fund analysis somewhat lacking in

detail; it does not, for example, tell what specific issues a fund invests in. Unlike other Prodigy output, Strategic Investor does let you download reports to either an ASCII file or a spreadsheet file for later examination and evaluation (there's a limit of 100 stock and 100 mutual-fund downloads per day).

Prodigy is weak on analysis tools, but its well-designed screens are a big asset.

Prodigy, \$13 per month. Prodigy Services Co., White Plains, N.Y.; 800-776-3449.

CIRCLE 424 ON READER SERVICE CARD

AMERICA ONLINE

America Online was launched as an Apple II information network in August of 1988 and later expanded to include Mac users. The PC version went on-line in February 1991; after just six months AOL claims to have more than 20,000 PC subscribers.

AOL is served by both Tymnet and Telenet. A subscription includes custom software topped with a Windows-like interface. While it is possible to access information on this network without a mouse, I don't recommend it.

The browse menu screen is divided into two parts: The left side shows a trail of where you have been, and the right side shows your choices. This is an effective way to keep your bearings in the tangled world of overlapping windows. The graphics are crisp, subdued, and to my eye the most pleasing of any of the networks.

The Business/Finance/Markets/Stocks window is located under the News & Finance heading on the browse menu. Areas of interest to the investor are: Market News, Stock Link, Busi-

ness News, and *USA Today's* Personal Investing, which has a too-brief paragraph or two from a dozen news stories related to investing.

Under Market News you'll find items like the current Dow Jones Industrial Average, prices for the most widely held stocks, and the previous day's major gainers and losers. Separate news headings cover the NYSE, the AMEX, OTC, bonds, commodities, currency, and mutual funds. There's an earnings section

where press releases announce the amount and dates of stock dividends.

Stock Link offers delayed quotations, stock trades, and portfolio management. Quotations can be retrieved by symbol or company name, but there is no way to batch symbols into a list. AOL allows you to set up only one portfolio, so you can't use that feature to track stocks you are interested in but don't yet own. Other than a gain/loss column there is no analysis avail-

able for portfolio entries; you'll have to do long/short-term computations and increase/decrease percentages yourself. Discount brokerage services are provided by a link with Quick & Reilly.

America Online, \$5.95 per month subscription includes 1 hour of non-prime-time usage. Thereafter, rates are \$8 per hour (prime time), \$4 per hour (other times). Quantum Computer Services Inc., Vienna, Va.; 800-827-6364.

CIRCLE 425 ON READER SERVICE CARD

GENIE

The GE Network for Information Exchange—better known as GENie—was founded in 1985 by the General Electric Co. Today's subscriber base numbers more than 260,000 PC enthusiasts. GENie has a cornucopia of entertainment, investment service and news features, and it has more round tables and bulletin boards dedicated to special-interest groups than any other network.

To gain access to GENie you must use third-party communications software—programs like *Crosstalk* or *PCTalk*—and the GE telecommunications network. The first requirement means you can easily download information for later analysis and study, something you can't always do on Prodigy or America Online. The ramifications of the second requirement depend upon where you live. There is a \$2 per hour surcharge for

some off-net cities.

Once you've established an account, you can download *Alladin*, which is a telecom package and front end designed to work specifically with GENie. The package automates much of your interaction with the service, and is available free; you only pay for the download.

GENie has numbered menus from which you can access its databases, but longtime subscribers go directly to specific areas by using keywords. The databases are organized like a book with different pages for each topic. Page 600, for example, is the Business and Financial Services Menu from which you can select topics like (3) GENie Quotes, (4) Vestor Investment Advisor, (8) Newsbytes News Network, (9) Charles Schwab Brokerage Service, (15) Investment Analyst, and—here's a surprise—(2) Dow Jones News/Retrieval.

The Quotes Database has several features for the investor.

SUITABILITY TO TASK

GENie

Collecting quotes	1			
Investor research			3	
News		2		
Portfolio management				4

In addition to yesterday's closing price (updated daily at 7 P.M.) for any particular issue, the summary shows the current price/earning ratio (p/e) and the dividend rate—both valuable statistics often left off of other networks' closing quotes. For historical data, GENie has both price and dividend information for the last five years. Unfortunately, GENie's menus are not well organized and information is sometimes hard to retrieve. To get a quote, for example, you must go through up to three menus—and that's after jumping directly to the quotes section.

CONTINUES

SUITABILITY TO TASK

AOL

Collecting quotes			3	
Investor research	N/A			
News			3	
Portfolio management		2		

After Hours

On-line Finance

CONTINUED

Eighteen market indicators are also part of the quotes database, including the 20 most-active issues, new 12-month high/lows, top 20 price advance/declines, top 20 percentage advance/declines, and stocks rising/falling for 3 to 5 days. The last figure is one I like to cross-check with insider trading reports.

Instead of trying to compete

with Dow Jones News/Retrieval, the folks at GENie decided to join them. By selecting menu item (2), Dow Jones News/Retrieval, you can connect directly to the world's largest private purveyor of financial information. Once connected, you can't distinguish the GENie gateway from directly calling DJN/R; Dow Jones rates apply and are billed on your GENie statement.

GENie's Portfolio function is easy to use. You may have as many portfolios as you like: one for growth stocks, one for speculations, and perhaps a third for stocks you are considering. A

numbered menu lets you create, delete, modify, list, and evaluate your portfolios. The evaluation, however, is limited to current value and gains/losses.

Vestor is a stock analysis service offered by Investment Technologies Co. in Edison, New Jersey. It carries a \$6 per hour surcharge and ITC bills your credit card an additional amount for reports. You enter the ticker symbol for a stock, future, or option (sorry, no mutual funds), and get back a plain-English report on the fundamentals of the issue, how ITC feels about this security, and buy/sell signals. No

wishy-washy recommendations here: The reports are very clear-cut. A search feature lets you look for stocks that meet selected criteria. Once you have settled on the stocks that you want, you can buy them on-line with the brokerage firm of Charles Schwab & Co.

GENie, \$5 per month for basic service during non-prime time. Basic service during prime time, \$18 per hour. Nonbasic services, \$18 per hour prime time, \$6 per hour other times. GE Information Services, Rockville, Md.; 800-638-9636.

CIRCLE 426 ON READER SERVICE CARD

COMPUERVE

In 1979, the CompuServe Information Service was launched and a year later H&R Block—the tax people—acquired the network. Today there are 815,000 subscribers. CompuServe is a leader in forums for PC support with some 240 hardware and software companies providing help through the network.

Many of the financial and investment services require subscription to the Executive Option, which costs a minimum of \$10 per month. A few financial services carry a surcharge, as does connection at 9,600 bps. Dial access is via a 350-city CompuServe network plus 800-access for more remote areas; the service is also available as a local telephone number in 11 foreign countries.

CompuServe has a numbered-menu interface that can be accessed by any standard telecommunications software. Like GENie and Dow Jones News/Retrieval, anything that scrolls across your screen can be captured to a file for later study. Although the menu-driven interface is similar to that of GENie and Dow Jones News/Retrieval, CompuServe does it faster and with more consistency. I encountered virtually no hesitations, and pressing Enter instead of making a menu choice always took me back to the previous screen. I never found myself floundering around trying to undo a mistake. Experienced users can bypass the menus and use GO commands to jump directly to the desired service.

CompuServe's investor services are under the Money Matters/Markets heading, where you'll find nine different items including Quotes, Company Information, Investment Analysis, Earnings/Economics Projections, Business News, and brokerage services (two: Quick & Reilly and Spear). Spear has a special deal allowing you to trade 11 stocks commission-free (100-share minimum).

Under the quotes menu you'll find the standard fare of delayed and historical quotes as well as ticker-symbol lookup. An abbreviated version of Vestor has a list of weekly stock picks and the stock screening program. Also available from the quotes menu is *Money* magazine's outstanding mutual fund screening and performance database that—thank you!—shows the major underlying securities of most funds.

The portfolio manager can be quickly reached by GO PORTFOLIO, although it is also on the Investment Analysis menu. It is the most comprehensive portfolio manager found on the networks, allowing you to name and describe as many portfolios as you need.

The heart of CompuServe's research information is found on the Company Information menu. Here you'll find the Value Line database, Standard & Poor's online, Disclosure II, Dun & Bradstreet information, TRW Credit Profiles, Corporate Affiliations, and CompuServe's own very thorough Company Analyzer. Type a ticker symbol, and Company Analyzer gives you a

menu of up to 17 items: corporate profile, price and dividend histories, bond and option data, financial statement, management discussion, forecasts, ownership, disclosure reports, and current news stories relating to the company. In the hindsight department, menu item 8 (Return-on-\$1,000 Invested), cuts through all the analysis to show what your \$1,000 *would* have done in one year. **CompuServe Information Service**, \$2 per month for unlimited access to a subset of

DOW JONES NEWS RETRIEVAL

Founded in 1974 by the Dow Jones Co.—publishers of the *Wall Street Journal* and *Barrons*—News/Retrieval is one of the oldest and most respected providers of on-line financial information. Originally the network was aimed at corporate managers and financial professionals. DJN/R has focused increasing attention on the individual investor, however, since the advent of the personal computer in the early 1980s.

News/Retrieval is billed by the minute at rates that vary greatly from a low of \$0.12 (at non-prime-time rates for Current Quotes at 300 bps), to a high of \$2.85 a minute (for TEXT ALL in prime

time at 2,400 bps.) Rates are time-, speed-, and database-sensitive.

News/Retrieval can be accessed through Telenet or Tymnet using standard communication software. Once you've signed on, entering //MENU gives you an overview of what's available and how the services are organized. Databases are accessed by typing //databasename.

In addition to delayed quotes

CONTINUES

SUITABILITY TO TASK

CompuServe

Collecting quotes	■	■	■	4
Investor research	■	■	■	4
News	■	■	■	4
Portfolio management	■	2	■	■

the service; \$12.50 per hour for most other services; surcharges may apply. CompuServe Information Service, Columbus, Ohio; 800-848-8199.

CIRCLE 427 ON READER SERVICE CARD

SUITABILITY TO TASK

DJNS

Collecting quotes	■	■	■	4
Investor research	■	■	■	4
News	■	■	■	4
Portfolio management	N/A			

ANNOUNCING

COMPUTER SELECT™

The Most Complete Database Of Computer Product Information Available



Get instant access to more than...

- ✓ 70,000 articles and abstracts from over 140 leading publications
- ✓ 70,000 hardware, software and communications product specs
- ✓ 12,000 company profiles, including addresses and phone numbers
- ✓ 9,000 definitions of computer and telecommunications terms.

Tens of thousands of reviews, analyses, buyer's guides and manufacturer listings—on one disc! COMPUTER SELECT makes it easy to browse titles, read entire articles, check abstracts and find the names and addresses of manufacturers...fast. You can copy data to a file or print out all or part of your search results. Call for a **free** demonstration disk!

Now there's COMPUTER SELECT. It's the new, enhanced version of the Computer Library database, developed by the publishers of PC Magazine and PC Week. With COMPUTER SELECT you can identify, evaluate and select the computer products you need in a fraction of the time.

Find All The Hardware And Software Information You Need...From Product Evaluations And Specifications Right Down To The Manufacturer's Phone Number

COMPUTER SELECT gives you immediate access to information from the best magazines, newsletters, technical and business publications reporting on the

COMPUTER SELECT HELPS ANSWER KEY QUESTIONS FASTER, SMARTER, EASIER

1. In a given product category, such as battery-powered 20 mhz 80386-sx portable computers, what are the available products...their specifications...their prices?
2. What are all the products in a given category whose list price is less than my budget?
3. Which products earned the best reviews in a given category?
4. What does the installed user base say about my options?
5. Will it run on my LAN?
6. What tips and techniques can I learn to get more from the products I use?
7. If I buy a particular product now, is the manufacturer likely to be in business if I need help later?
8. What are the benefits of upgrading to the new version of a software product I use?
9. How do I reach a manufacturer? Is there an 800 number?
10. What are the marketing strategies of a given computer industry company...who is the key marketing contact?

computer industry. Researching products can be done quickly and efficiently right at your desk.

Then, when you find the product that's best for your needs, you can obtain its specifications and locate the manufacturer in a snap. Because now COMPUTER SELECT incorporates all the reference information from *Data Sources*® the leading computer industry directory. That means you'll find specs for over 67,000 hardware, software and data communications products—plus profiles of the 11,000 companies that make the products you want.

YOU'LL SEE RESULTS IN LESS THAN ONE HOUR

New users are doing productive work in less than one hour. No installation is needed. Just pop in the CD-ROM disc and a few simple steps locate, retrieve and print the information you want. And a new, updated disc is sent to you each month so you'll always have current product information.

FREE!

If you call now and become a COMPUTER SELECT subscriber you'll receive a BONUS DISC FREE!

This disc contains the complete COMPUTER SELECT publication file covering all of 1990 to use as the base of your computer library. Combined with the new discs you'll receive as a subscriber, you'll have a comprehensive database of both historical and current information!

COMPUTER SELECT is "Highly Recommended" for...
 • Micro Managers, PC Coordinators, MIS Directors, LAN Administrators • Purchasing Agents • Information Center Managers • User-Support Groups • Training Organizations • Programmers, Developers • Product Marketers and Planners • Resellers, OEMS, VARS, System Integrators • Journalists, Consultants, Industry Analysts • Salespeople, Public Relations Managers • Law Firms

CALL NOW FOR A FREE DEMONSTRATION DISK

212-503-4400

COMPUTER LIBRARY

Computer Library, Computer Select and Data Sources® are trademarks of Ziff Communications Company © 1991 Ziff Communications Company

COMPUTER SELECT helps you S-T-R-E-T-C-H your resources!

In today's economic climate many companies have put a lid on support expenditures, but not on workload or expectations. That's why COMPUTER SELECT is more essential than ever. It's designed to stretch your support resources and promote cost-effective purchasing.

"COMPUTER SELECT is the best single source of industry information available, and it's at my fingertips whenever I need it."

Jonathan D. Lazarus/Microsoft Corporation
 General Manager, Systems Software Marketing

"The real value of COMPUTER SELECT is in the hidden cost of missed information that could be mission-critical. With this product's ability to conduct broad-based queries, you can be confident that you have checked all the relevant sources and you're thoroughly up-to-date."

Bob Hayes/Nordstrom, Inc.
 Technology Architecture Manager

"I was looking for a tape backup device that could hold 2.2 gigabytes. A search like that used to take days. With COMPUTER SELECT it took 10 minutes to get all the information I needed."

Joseph Curtis/Con Edison
 General Manager for Systems Engineering

After Hours

On-line Finance

CONTINUED

(//CQE) and historical quotes (//HQ), News/Retrieval offers real-time quotes from the New York and American stock exchanges, and on about 3,000 NASDAQ issues. This is a real bargain. After signing an agreement with the exchanges and paying a monthly fee (\$11 for personal accounts, \$127.50 for business accounts), you can access real-time quotes for the same price as delayed quotes—about \$2.50 per minute during prime time. This is an indispensable service for active traders.

One of the most popular databases on News/Retrieval is //TRADELINE, which has pricing, dividend, and financial data for up to 15 years on 120,000 U.S. and Canadian stocks, bonds, mutual funds, and government securities; also included are 25,000 actively traded international issues. //FUTURES has current and historical quotations for commodities and financial futures. The //FUNDS database supplements quotes and TradeLine with detailed performance and statistical data for 1,500 mutual funds, including the week's top 25 performers; it does not have a list of the major holdings of each mutual fund, but it compares each fund with the other funds having the same objective.

There are several databases that contain company and industry information useful to the prudent researcher. These include SEC filing extracts, earnings forecasts, analysts' reports, statistical comparisons, comprehensive company reports, Standard & Poor's earnings estimates, and insider trading reports. You can access these databases individually, or you can use the //QUICK command which, with just a few keystrokes and a fee of \$49, gives you a comprehensive report containing all of this information. //QUICK is similar to CompuServe's Company Analyzer, but more expensive.

Dow Jones News/Retrieval has an on-line trading connection with the Fidelity Brokerage

firm. It does not have any sort of portfolio command or database where you can store your stocks and quickly evaluate them.

News is where Dow Jones cut its teeth, and no one does financial news better. Indeed, most of the other computer networks get their news from Dow Jones, either directly or indirectly through third parties. The //WIRES database, which is continuously updated from seven newswires, and the //BUSINESS database with the latest economic and financial news, are two of the most timely for investors. The problem is, there is so much news flowing through these channels that even after filtering it, it's a full-time task to read it all. The //CLIP command helps by constantly "watching" the newswires for key phrases and ticker symbols you specify, and saving those stories in a folder for your review. CompuServe has a similar clipping service covering fewer newswires.

Dow Jones News/Retrieval. Rates are time, modem speed, and database-sensitive, and vary between \$0.12 per minute and \$2.85 per minute. A package of six services (in non-prime time) is available at \$25 per month. Dow Jones & Co., Princeton, N.J.; 800-522-3567 (in N.J., 609-520-8349).

CIRCLE 428 ON READER SERVICE CARD

SUMMARY

All five of these networks offer basic investment tools like delayed quotations, news, and on-line trading. Prodigy and America Online have similar levels of service, although AOL lets you create, store, and update a single portfolio. Prodigy has a small database for researching companies, while AOL lacks this type of research tool. If all you want to do is check an occasional stock price, either service will do.

Genie has an excellent portfolio manager and, by virtue of

its Dow Jones connection, an abundance of financial products. However, GENIE's menuing structure made it more difficult for me to use than the other networks.

CompuServe and Dow Jones News/Retrieval are clearly the choice for serious, professional investors. CompuServe gets a thumbs up for consistency in its menu structure, and it also has a portfolio function, which Dow Jones sorely needs; but Dow Jones has real-time quotes.

It's difficult to pin down the real cost of any of these services because there are so many promotional options, special deals, levels of service, and user discounts. It's safe to say that Dow Jones is the most expensive, and CompuServe the least expensive. But you can certainly agree that all of the networks are bargains when compared with full-service brokerage commissions or when computed as a percent of your investment portfolio. ■

FINANCIAL MANAGEMENT TOOLS: SUMMARY OF FEATURES

	AOL	CompuServe	DJNS	Genie	Prodigy
QUOTATIONS					
Delayed stock	■	■	■	■	■
Historical stock	□	■	■	■	□
Real-time stock	□	■	■	■	□
Bonds	□	■	■	■	■
Mutual funds	■	■	■	■	■
Download quotes	□	■	■	■	□
STATISTICS					
DJ averages	■	■	■	■	■
Dividends	■	■	■	■	■
Earnings per share	□	■	■	■	■
INVESTOR RESEARCH					
S&P	□	■	■	■	□
Value line	□	■	■	■	□
Trade line	□	■	■	■	□
Company analysis	□	■	■	■	□
Vestor	□	■	■	■	□
Other	□	■	■	■	■
NEWS					
Dow Jones Newswires	□	■	■	■	■
Reuters News Wire	□	■	■	■	□
PR Newswire	■	■	■	■	□
United Press International	■	■	■	■	□
NewsGnd	□	■	■	■	□
Clipping Service	□	■	■	■	□
On-line forums/seminars	■	■	■	■	□
PORTFOLIO					
Manager	■	■	□	■	□
On-line trading	■	■	■	■	■
Affiliate	Quick & Reilly	Quick & Reilly, Spear	Fidelity	Schwab	Donaldson, Lufkin & Jenrette

* Through Dow Jones News/Retrieval gateway.

■—Yes □—No

"Dow Jones helps me protect the assets of this vital multinational outfit."

—David Hess, Executive Director, Environmental Resources and Energy Committee, Pennsylvania Senate

David Hess works for the state.

But he also works for his neighbors, strangers and countless inhabitants of the animal kingdom.

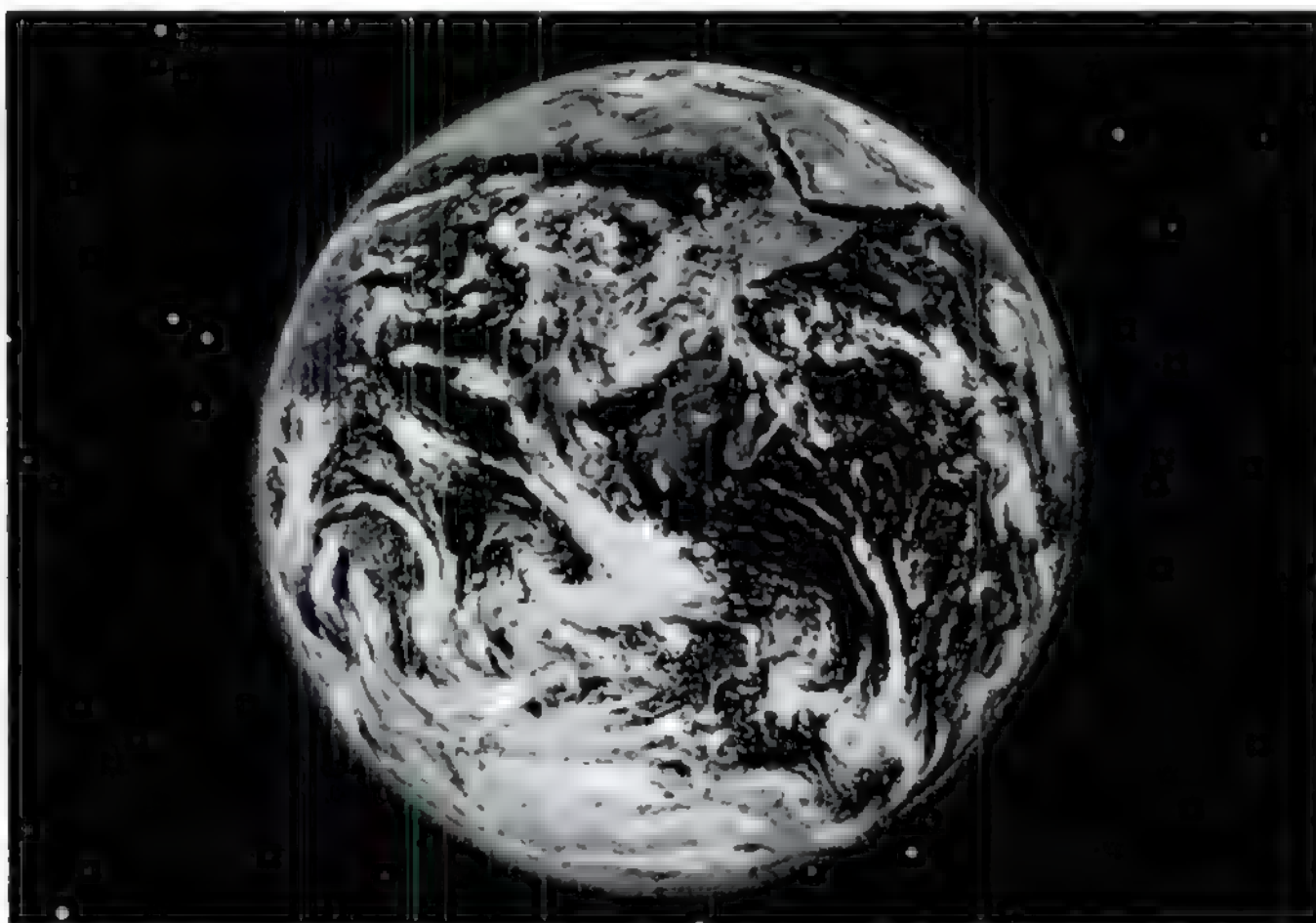
Because David Hess helps develop environmental legislation for the state of Pennsylvania.

And he's discovered a significant way to help protect the world's limited resources. He simply taps into the practically unlimited resources of Dow Jones News/Retrieval.

Within seconds of his request, a world of comprehensive, timely and accurate information makes its way to his computer. And suddenly David Hess knows how communities next door and thousands of miles away approach the same problems.

If wetlands legislation is enacted anywhere in the country, one of the many local and regional newspapers will have the story. If a fast food company announces a new recycling plan, the news is on the screen within seconds of its release.

Also making his job easier are hundreds of other rich information sources, including the complete text of *The Wall Street Journal* and full coverage of all the Dow Jones Newswires.



As Hess says, "Before, I had to pore through the library, call each state over and over again. Or worse, not have the information at all. I can't emphasize enough how much time I save by using News/Retrieval for everything I do."

A savings that's reflected on the profit/loss statement of the one enterprise we all belong to.

DOW JONES
NEWS/RETRIEVAL®
The lifeblood of business.™
Another Service from Dow Jones Information Services

For more details, call 1-800-522-3567, Ext 722. In N.J., call 1-609-520-8349, Ext 722.

Dow Jones News/Retrieval is a registered service mark and The Wall Street Journal is a registered trademark of Dow Jones & Company, Inc. © 1990 Dow Jones & Company, Inc. All Rights Reserved.

by
Bill Howard

Abort, Retry, Fail?

The Lighter Side of Personal Computing



**CLASSIFIED
INTELLIGENCE**

"Northridge Drive. Trash computer, Lowery organ, antique rocker, coffee table, misc."

—*Thrifty Nickel* pennysaver
(Driftwood, Tex.),
June 6, 1991

FOR THE



The Panasonic KX-W1025 word processor includes a 14 line screen, a built-in dictionary and thesaurus and a mailing list mode. It uses a daisy wheel to print correspondence-quality type.

This is a word processor? Photo in *The Cleveland Plain Dealer*, February 2, 1991.

Notes from the Police Blotter: More Computer Crime

"An IBM computer belonging to Southeast Missouri State University was found at the university Monday. Police said they believe the computer, left in some bushes, was involved in an attempted theft."

—Police report,
Southeast Missourian
(Cape Girardeau, Mo.), May 14, 1991

If your entry is used in *Abort, Retry, Fail?* we'll send you \$50 and a *PC Magazine* T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of entry are considered. Winners this issue: Geoffrey Rothwell (Texaco computer), Garry Campe (Panasonic KX-W1025 word processor), Tom Bauman (trash computer), Gary L. Bassett (computer in crime).

Not Just Assembled But Proudly Assembled In the U.S.A.

Ever wonder about the marketing offers stuffed in with your credit card bills? Are the products really worth the money? Consider the Blue Chip PC offered by Texaco's credit card marketing group: "Proof positive that a high-performance, user-friendly home computer system doesn't have to be high priced," Texaco says. Actually, this \$999.80 PC system is low-octane: 256K RAM, a single 360K floppy disk, amber monitor, and dot matrix printer. But you can feel good about its somewhat American heritage, as the Texaco fine print notes: "12" Amber Monitor made in Taiwan, 256K Computer made in Korea. Dot Matrix Printer made in Japan. All components assembled in USA." Well, at least the bill insert didn't smell like a perfume ad.

TEXACO

OUR CATALOG IS FREE. OUR COMPUTERS ARE JUST A LITTLE MORE.

Send for the brand new Dell product catalog,
loaded with information on all our award-winning
computers, service and support. Plus, get the details

on our newest line of PCs, laptops, note-
books and servers.

Return this card today, or call us.

TO ORDER, CALL PLEASE REFERENCE #11BL3	
800-873-1130	
HOURS: 7AM-9PM CT MON-FRI	8AM-4PM CT SAT
IN CANADA, CALL 800-668-3021. IN MEXICO 95-800-010-0664.	



Mail this postage-free card and we'll send you the new Dell Catalog with information on our newest line of PCs, laptops, notebooks and servers. You'll also find out about our award-winning service and our low prices, so return this card today, or call us at (800) 873-1130. In Canada, call (800) 668-3021. In Mexico, call 95-800-010-0664.

☐ Please have a Dell Representative call me.

Name: (M) _____
(Please print)

Title: _____

Company: _____

Address: _____
(If Applicable)

City: _____ State: _____ Zip: _____

Type of Business: _____

Approx. # of Employees in Company: _____

Home Phone: (_____) _____

Business Phone: (_____) _____

Fax #: (_____) _____

1. Which products are you most interested in?

- | | |
|---|--|
| ☐ 286-based systems | ☐ UNIX [®] based systems |
| ☐ 386 [™] SX -based systems | ☐ Laptops/Notebooks |
| ☐ 386-based systems | ☐ Other: _____ |
| ☐ i486 [™] -based systems | |

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company?

7. Are you interested in leasing? ☐ Yes ☐ No

AD CODE 51BL3

Mail this postage-free card and we'll send you the new Dell Catalog with information on our newest line of PCs, laptops, notebooks and servers. You'll also find out about our award-winning service and our low prices, so return this card today, or call us at (800) 873-1130. In Canada, call (800) 668-3021. In Mexico, call 95-800-010-0664.

☐ Please have a Dell Representative call me.

Name: (M) _____
(Please print)

Title: _____

Company: _____

Address: _____
(If Applicable)

City: _____ State: _____ Zip: _____

Type of Business: _____

Approx. # of Employees in Company: _____

Home Phone: (_____) _____

Business Phone: (_____) _____

Fax #: (_____) _____

1. Which products are you most interested in?

- | | |
|---|--|
| ☐ 286-based systems | ☐ UNIX [®] based systems |
| ☐ 386 [™] SX -based systems | ☐ Laptops/Notebooks |
| ☐ 386-based systems | ☐ Other: _____ |
| ☐ i486 [™] -based systems | |

2. Are you interested in computer products for:

- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:

- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?

6. How many PCs do you have installed now at your company?

7. Are you interested in leasing? ☐ Yes ☐ No

AD CODE 51BL3

ORDER OUR FREE CATALOG NOW OR PAY THOUSANDS LATER.

For A Free Catalog Of
Dell's New Computers, Send This Card.



1386 and 1486 are trademarks of Intel Corporation. UNIX is a registered trademark of UNIX Systems Laboratories, Inc. in the U.S. and other countries. ©1991 Dell Computer Corporation. All rights reserved.

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 6745 AUSTIN, TEXAS

POSTAGE WILL BE PAID BY ADDRESSEE

DELL COMPUTER CORPORATION
DEPT DH
9505 ARBORETUM BLVD
AUSTIN TX 78759-9860



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

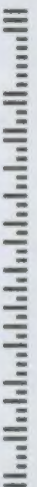


BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 6745 AUSTIN, TEXAS

POSTAGE WILL BE PAID BY ADDRESSEE

DELL COMPUTER CORPORATION
DEPT DH
9505 ARBORETUM BLVD
AUSTIN TX 78759-9860



VGA graphics.
Non-interlaced 256-color
at 800 x 600 or 16-color at
1024 x 768 resolution,
built into the system
board. No video
cards. No flicker.

BIOS is on
Flash EPROM.
Upgrade or modify
from floppy without
removing chips.

Custom memory controller
ASIC delivers higher
performance and reliability
than standard PAL.

Upgrade easily to a
50 MHz 486 processor.

SmartVu Diagnostic Display
troubleshoots even if the
monitor is not working.

Behind the SmartVu™ module
lie industry standard SIMMs
so extra memory can be added
easily and inexpensively.

NOBODY ELSE HAS THE GUTS TO SAY THIS.

Dell's ingenious i486 system innovations not only help
you outwit your competition, they help us outwit ours.

Our high-powered i486 PC is the Dell PowerLine
433DE, running at 33 MHz, and our 420DE is based on
Intel's 20 MHz i486SX microprocessor. Built on the EISA

we've designed the system to include a full range of
upgrade and expansion capabilities.

Now that we've poured our guts out, it's your turn.

Just describe your needs and we'll help you configure
the ultimate powerhouse. Which we'll custom build,
test and ship to you with a 30-day no questions asked
money back guarantee, and a one-year limited warranty.

All this, plus the fact that the Dell PowerLine 433DE
costs so much less than many i486 systems, may make
those others a little hard to stomach.



THE NEW DELL POWERLINE 433DE 33 MHz i486 SYSTEM
SYSTEM INCLUDES VGA COLOR
PLUS MONITOR, 100 MB HARD DRIVE, 4 MB RAM*

bus, they have unique features
that give them plenty of muscle
for CAD, CAE, animation,
3D, solids modeling and
applications where maximum
performance is
required.

Furthermore,



TO ORDER, CALL, PLEASE REFERENCE #11BL2

800-545-9674

HOURS: 7AM-9PM CT MON-FRI 8AM-4PM CT SAT
IN CANADA 800-668-3021 IN MEXICO 95-800-010-0664



SEE INSIDE FOR DETAILS.



For more information on the new Dell® PowerLine™ 433DE 33 MHz i486™ System turn the page.

TO ORDER, CALL, PLEASE REFERENCE #11BL2.
800-545-9674
HOURS: 7AM-9PM CT MON-FRI 8AM-4PM CT SAT
IN CANADA 800-668-3021. IN MEXICO 95-800-010-0664.

DELL
COMPUTER
CORPORATION